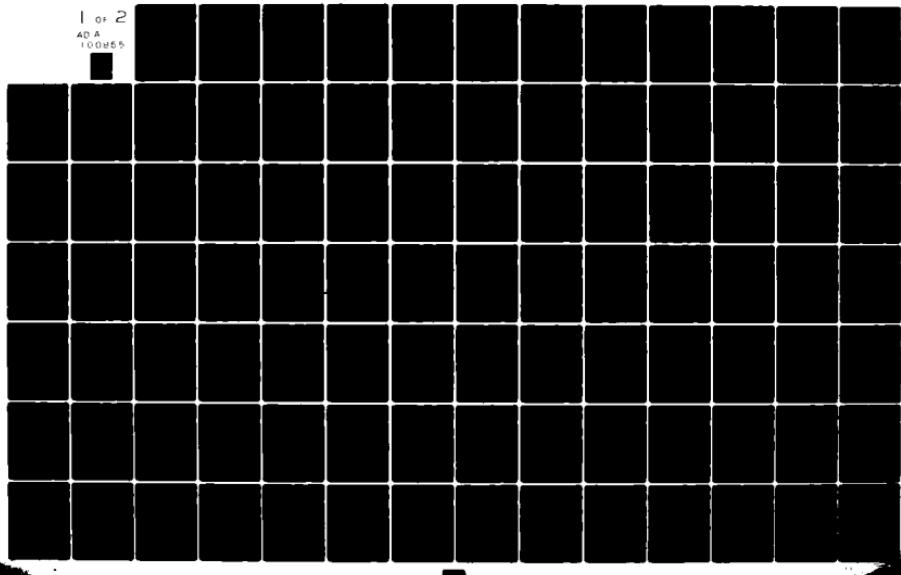


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COST IMPLICATIONS OF HARDWARE MANPOWER BALANCE:
PHASE II - UNIT SUSTAINMENT MANPOWER COST METHODOLOGY

By
Rodney D. McConnell
Patricia A. Insley
William E. Depuy, Jr.
Jerome C. Ford
Clifton N. Horton

1 June 1981

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Management Consulting & Research, Inc. (MCR) has developed analytical tools to assist in evaluating weapon system manpower requirements. The tools are: a definition for analyzing weapon system unit manpower requirements in terms of their high-cost/critical occupations; and a methodology for costing weapon system unit manpower which reveals occupation- and pay grade-specific cost relationships of the weapon system unit manpower requirements. This report documents the following results:			

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The application of the definition of high-cost/critical occupations, which is a refinement of the Phase I definition. A description of the unit sustainment manpower cost methodology, which includes a refinement of the initial unit methodology. The unit sustainment manpower cost data for selected weapon systems that refines the initial unit test data. A description and demonstration of the unit manpower life cycle cost methodology which includes initial unit and unit sustainment cost methodologies. The application of the analytical tools in the analysis of weapon system manpower requirements.

The definition and cost methodology are demonstrated using unit manpower for three major weapon systems: the Army M-1 tank, the Navy LAMPS Mk III helicopter system, and the Air Force ground launched cruise missile.

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PREFACE

Management Consulting & Research, Inc. (MCR) is currently under contract to the Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics (OASD (MRA&L)), Contract No. MDA 903-80-C-0553, Cost Implications of Hardware Manpower Balance. The scope of this study effort is divided into three phases:

- Phase I - Initial Unit Manpower Cost Methodology
- Phase II - Unit Sustainment Manpower Cost Methodology
- Phase III - Expand Weapon System Data Base and Develop Computer-Aided Capability

Phase I of this effort has been completed and documented in MCR's TR-8006-1, "Cost Implications of Hardware Manpower Balance: Phase I - Initial Unit Manpower Cost Methodology." The Phase II effort is documented in this technical report and supersedes the Phase I methodology. This report addresses the following major areas, each of which is described in a separate section:

- application of the definition of high-cost/critical occupations, which is a refinement of the Phase I definition;
- description of the preliminary unit sustainment manpower cost methodology, which includes a refinement of the initial unit methodology;
- unit sustainment manpower cost data for selected weapon systems, that refines the initial unit test data;
- a description and demonstration of the unit manpower life cycle cost methodology which includes initial unit and unit sustainment cost methodologies; and
- application of MCR-developed tools.

EXECUTIVE SUMMARY

The Office of the Under Secretary of Defense for Research and Engineering (OUSD (R&E)) has issued guidance that the impact on Service assets of weapon system manpower requirements will be considered in system design and acquisition.^{1/} Since then OASD (MRA&L) has worked with the Services on an overall effort, entitled "Hardware-Manpower Balance," to develop approaches to the problem of maintaining increasingly complex weapon systems with a diminishing supply of high-aptitude people.

Management Consulting & Research, Inc. (MCR) has been tasked to develop analytical tools to assist in evaluating weapon system manpower requirements. The "two-pronged" approach taken in this effort has been designed to consider the two key resource areas of weapon system manpower:

- requirements, which concern the quantity, by occupation, of manpower needed for the weapon system and the organizational units which operate and maintain the system; and
- costs, which concern the amount of money which must be budgeted to operate and maintain the system and its organizational units. This particularly applies to cost impacts relating to the specific composition of the required weapon system manpower.

MCK has developed analytical tools to use in examining the impacts of specific weapon system manpower requirements on these two separate, but related, resource areas. The two tools, described and demonstrated in this report, are:

- a definition for analyzing weapon system unit manpower requirements in terms of their high-cost/critical occupations; and

1/ DoDI 5000.2, "Major System Acquisition Procedures," March 19, 1980.

- a methodology for costing weapon system unit manpower which reveals occupation- and pay grade-specific cost relationships of the weapon system unit manpower requirements.

These two tools are interrelated and when used together produce a multidimensional portrait of weapon system unit manpower. The definition and cost methodology have been demonstrated on unit manpower data for three major weapon systems:

- the Army M-1 Tank,
- the Navy LAMPS Mk III, and
- the Air Force Ground Launched Cruise Missile (GLCM).

The definition and cost methodology are briefly described and the results of demonstrating these tools on the selected weapon systems are summarized below.

The definition of high-cost/critical occupations is used to analyze the characteristics of the weapon system unit occupation and pay grade requirements. The definition is composed of three elements:

- Mission Essentiality, determined on the basis of job titles of the positions within the organizational unit. We have used the rule that only operators and maintainers are mission essential. This characteristic is sufficient to qualify an occupation as high-cost/critical.
- High-Cost, determined on the basis of comparing combined occupation-specific costs (i.e., training costs, enlistment bonus cost, and selective reenlistment bonus (SRB) costs) to a selected baseline cost (for example, average training cost for the Service). The purpose of the comparison of total occupation-specific costs to a baseline cost is to indicate those occupations with higher than average costs. This characteristic is sufficient to qualify an occupation as high-cost/critical.
- Inventory Shortage, determined on the basis of examining authorizations and inventories for the required pay grades in each high-cost/critical occupation. A shortfall must be greater than some threshold. We have used the rule of 2.0% below authorized level as the basis for qualifying an occupation/pay grade combination as having an inventory shortage. The 2.0% threshold was used based on the pattern of the authorization

and inventory data analyzed. The 2% threshold is not significant in terms of readiness, but is used only as a reasonable value for analysis. This characteristic is not sufficient to qualify an occupation as high-cost/critical, but must be considered in conjunction with the other two characteristics.

Table 1 summarizes the results of applying this definition to unit manpower data for the three systems. Statistics are shown for the occupations (i.e., MOSs, ratings, and AFSCs), and the quantity of personnel required in those occupations.

This analysis of the occupational requirements of the selected weapon systems shows that all three of the systems are in potentially vulnerable positions due to the preponderance of unit personnel in high-cost/critical occupations. This vulnerability takes two forms:

- potential impacts because of the quantity of personnel in high-cost occupations, thus vulnerable to Q&S budget reductions; and
- potential impacts because of the quantity of personnel in mission essential occupations, thus vulnerable to continued inventory shortages which could cause readiness and reliability degradation.

These problems may arise because of the following results:

- A tank battalion equipped with the M-1 has 82.6% of its 511 enlisted personnel in the 21 (of 32) high-cost/critical occupations.
- The LAMPS Mk III operational squadron has 73.7% of its 232 enlisted personnel in the 11 (of 23) high-cost/critical occupations.
- The GLCM flight has 94.7% of its 75 enlisted personnel in the 12 (of 15) high-cost/critical occupations.

Analysis of the data for the selected weapon systems has pointed out that examination of this level of detail is valuable in that it provides insight into the relationships and drivers of the manpower requirements for the unit. For example, it is not sufficient to look at the total authorizations and inventories for an occupation. The status of specific pay grades must be examined in order to determine real impacts. Quite often shortfalls in more senior pay grades are offset by large

Table 1. RESULTS OF HIGH-COST/CRITICAL OCCUPATION ANALYSIS

WEAPON SYSTEM	QUANTITY	HIGH-COST/CRITICAL		MISSION ESSENTIAL		HIGH-COST		INVENTORY SHORTFALL	
		QUANTITY	%	QUANTITY	%	QUANTITY	%	QUANTITY	%
M-1 Personnel	Moss	32	21	65.6	4	12.5	21	65.6	20
	Personnel	511	422	82.6	274	53.5	422	52.5	413
LAMPS Mk III*	Ratings	23	11	47.8	9	39.1	5	21.7	11
	personnel	232	171	73.7	162	69.8	71	29.2	171
GLCM	AFSCs	15	12	80.0	8	53.3	8	53.3	12
	Personnel	75	71	94.7	25	33.3	61	31.3	71

*Data for an Operational Squadron only as distinct from a Fleet Readiness Squadron.

inventories in first term pay grades. Also, for examination of costs of manpower it is necessary to look at the details of these costs such as bonuses. Additional details of these analyses are contained in Section II of the report.

The initial unit manpower cost methodology, developed in Phase I of this study, is used to calculate the costs of initially acquiring unit manpower. This methodology uses occupation-specific data to develop manpower costs.

The unit sustainment manpower cost methodology uses occupation- and pay grade-specific data, to analyze unit manpower costs. This cost methodology is composed of two element structures:

- the manpower strength element structure, identifying four categories of personnel:
 - unit mission personnel,
 - intermediate maintenance personnel,
 - installation support personnel, and
 - indirect personnel support; and
- the manpower cost element structure, identifying two major types of costs:
 - recurring personnel acquisition costs, which are recurring costs associated with personnel attrition and replacement, and are calculated using annual personnel loss rates, called here unit sustainment factors; and
 - annual unit sustainment costs, which are annual costs related to all of the people in the unit and are based on the estimated manpower requirements of the unit.

These two types of costs are calculated for the level of manpower strength required (in this study, enlisted unit mission personnel only) and combined to produce an estimated annual unit sustainment, or operating and support, manpower cost. Table 2 lists the strength element structure. Table 3 lists the cost element structure.

Table 2. MANPOWER STRENGTH ELEMENT STRUCTURE

- Unit Mission Personnel
 - Crew/Operators
 - Organizational Maintenance
 - Other Unit Personnel
- Intermediate Maintenance Personnel
- Installation Support Personnel
 - Base Operating Support
 - Real Property Maintenance
 - Medical
- Indirect Personnel Support
 - Individuals
 - Transients
 - Holdées (Prisoners, Patients, etc.)

Table 3. UNIT SUSTAINMENT MANPOWER COST ELEMENT STRUCTURE

<u>Recurring Acquisition Costs*</u>	<u>Annual Unit Sustainment Costs</u>
● GENERAL COSTS**	● GENERAL COSTS**
- Personnel Recruitment	- Permanent Change of Station (PCS)
● OCCUPATION-SPECIFIC COSTS	● PAY GRADE-SPECIFIC COSTS
- Enlistment Bonus	- Pay and Allowances
- Selective Reenlistment Bonus (SRB)	- Retirement
- Training	- Support
	- Incentive and Special Pay (ISP not included)

* Amortized costs calculated using unit sustainment (personnel loss rate) factors recurring at intervals dependent on loss rates.

** Non-occupation-specific or pay grade-specific costs.

In applying this methodology, unit mission personnel are identified by occupation and pay grade. Occupation-specific costs are calculated based on the quantities of personnel in each occupation. Pay grade-specific costs are calculated based on the quantity of personnel in each pay grade. The totals for these two cost groups, as well as those costs which are generally applied to all personnel (i.e., Recruitment and PCS), are totalled to produce the unit sustainment cost for the weapon system.

A more detailed explanation of the MCR unit sustainment manpower cost methodology, as well as a brief description of Service methodologies, is provided in Section III of the report.

The MCR-developed unit sustainment manpower cost methodology has been demonstrated on the three weapon systems selected to represent the Army, Navy and Air Force. In an effort to determine the impact of using this more detailed approach, the same data have been costed using a Service manpower cost methodology. The results of applying each of these methods to a single organizational unit are compared on Table 4.

Comparable MCR and Service manpower cost elements have been aligned on the table. MCR costs were calculated for the 511 enlisted personnel of an M-1 tank battalion and Army costs were calculated based on the allocated manpower per M-1 tank. The MCR costs were converted to a cost per tank in order to compare them with Army costs. The LAMPS Mk III comparison is for the 232 enlisted personnel of an operational squadron. The GLCM comparison is for the 75 enlisted personnel of a single flight.

There are two conclusions reached as a result of these analyses:

- There are two major reasons why weapon system unit manpower costs developed using the unit sustainment manpower cost methodology are higher than the costs developed with the Service methodologies:

Table 4. SUMMARY OF WEAPON SYSTEM UNIT SUSTAINMENT MANPOWER COST COMPARISON
 (FY 80 Dollars in Thousands)

COST ELEMENT	M-1 M6P	(Costs per Tank) ARMY	LAMPS Mk III (Costs per Squadron) NAVY	ELCM	
				MCR	(Costs per Flight) Air Force
Pay and Allowances	97.9	94.5	2,876.7	892.1	576.4
Support	10.6	15.1	440.1	139.4	87.3
Recruitment	3.2	/	126.2	34.9	10.2
Training	15.1	/	401.7	557.4	55.5
SCS	5.4	6.4	164.7	141.5	21.1
Enlistment Bonus & SRB	--	--	60.5	includes: Enlistment Bonus & SRB	includes: Enlistment Bonus & SRB
TOTAL	133.2	134.8	4,910.1	1,251.2	1,116.5
Additional Costs Excluded by Services					
Retirement	24.5	--	721.1	--	219.3
Enlistment Bonus & SRB	1.3	--	--	--	--
TOTAL	16.8	134.8	4,910.1	1,251.2	1,116.5

x

- The use of occupation- and pay grade-specific costs rather than average costs; and
 - The inclusion of the accrued costs of future retirement annuities, which is the single largest reason for differences between costs developed with the MCR methodology and those developed using the Service methodologies.
- In those cases where the Service methodologies use occupation- and pay grade-specific data, the estimates for that element are close to MCR's calculations. However, the use of different factors or the inclusion of additional cost elements (e.g., Bonus and Retirement costs for the M-1 calculations) in the MCR methodology resulted in higher costs than Service estimates. Specifically:
 - The M-1 manpower costs, excluding bonus and retirement costs, were very close (within 1%). This is due to the Army derivation of precise occupation- and pay grade-specific costs for pay and allowances and personnel replacement (recruitment and training). However, the inclusion of retirement and bonus costs increased the total cost using the MCR methodology by 22%. Until DoD makes a decision to include the accrued cost of future retirement, it appears that Army weapon system costing is quite precise.
 - The LAMPS Mk III costs, excluding retirement, are 15% higher using the MCR methodology. This is due to the use of pay grade-specific, rather than average, pay and allowance and support data. The inclusion of retirement costs increased the estimate by 21%.
 - The GLCM manpower costs, excluding retirement, are 12% higher using the MCR methodology. This is due to the use of pay grade-specific, rather than average, support cost and pay and allowances as well as the use of occupation-specific, rather than Service-wide, loss rates to calculate annual training costs. The inclusion of retirement increased the estimate by 20%.

Details of the application of the MCR and Service manpower cost methodologies are provided in Section IV of the report.

The following conclusions have been reached based on the application of the high-cost/critical occupation definition and the cost methodology to actual weapon system data:

- Based on the limited sample analyzed (one weapon system for each Service), it is not possible to determine if the kinds of relationships identified in these analyses are exceptions or the norm, although we suspect they are the norm. However, application of the definition and cost methodology to a larger group of weapon systems would allow definitive conclusions to be made.
- It is necessary to examine the details of weapon system unit manpower requirements, since it is only through this process that the Services can identify exactly where potential problems exist. Evaluation of aggregated estimates makes this impossible and, frequently, obscures the fact that a problem exists.
- The utility of these tools is not only in the numbers they produce, but also in the examination of the detailed relationships among the various requirements and cost drivers.
- The analyses documented in this report indicate that each of the three weapon systems analyzed may experience substantial personnel problems (inventory shortage, readiness) due to the quantity of the high-cost/critical personnel they require. The true magnitude of these problems can only be determined following an analysis of total Service projected assets and demands.

MCR developed an initial unit manpower cost methodology in Phase I of the project. This is used to calculate the cost of initially acquiring unit manpower. When combined with the unit sustainment manpower cost methodology developed in this phase of the study a unit manpower life cycle cost may be calculated. A discussion of the unit manpower life cycle cost methodology and its demonstration on the LAMPS Mk III are provided in Section V of the report.

OASD (MRA&L) has developed the "Hardware-Manpower Balance" project in order to examine the relationship of hardware design, acquisition decisions, and manpower constraints. This is part of the overall expansion of the analysis of weapon system resource demands identified in DoDI 5000.2. The Integrated Program Summary (IPS), outlined in that instruction is an example

of this DoD-wide expansion of weapon system manpower and training analysis.

The tools developed by MCR during this project address two of the most critical resources of weapon system operations and support: manpower resources and dollar resources. Manpower for weapon systems must be acquired, trained and sustained. Weapon system manpower costs are directly influenced by the type of manpower required by the system. This has been clearly demonstrated by the high-cost/critical occupation definition and unit manpower cost methodologies developed and presented in this report.

The definition and cost methodology developed during this project have been tailored to provide a coordinated approach to analyzing the manpower impacts of system demands. As demonstrated in this report, much valuable information can be obtained by analyzing the detailed unit manpower requirements.

MCR recommends that the tools developed during the project be used by the ASD (MRA&L) to encourage the Services to identify and help resolve existing and potential manpower problems. Specifically, we recommend that OASD (MRA&L):

- Develop an approach which can be used to analyze weapon system manpower requirements as early as possible (DSARC I if strengths are available). These requirements, analyzed in terms of the definition of high-cost/critical occupations, should be examined in light of Service inventory projections, and problem areas should be identified. This analysis should examine first the unit mission personnel and then be expanded to include all requirements above the organizational level and below the depot level. This analysis would provide information on and insights into:
 - potential manpower problems such as:
 - excessive requirements for highly experienced senior personnel,
 - requirements for occupations which are already experiencing inventory shortages, and

- requirements in mid-level pay grades which are already experiencing inventory shortages;
 - system occupations with extremely specialized training requirements, but which have limited potential for utilization on other systems;
 - the requirement for occupations which require long training periods;
 - the requirement for occupations which are very expensive to develop;
 - the potential cost advantages of cross-training personnel experienced on similar systems; and
 - the broader impacts of the relationship of system design to occupation and pay grade requirements, and any alternatives to these approaches.
- The results of the analyses discussed above should be used to focus on alternative concepts for system manning. If the manning requirements cannot be changed (e.g., the occupation is mission essential), then a manpower acquisition strategy must be developed to ensure the availability of the required personnel.

Details of the application of the MCR-developed tools in the analysis of weapon system manpower requirements are provided in Section VI of the report.

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I. INTRODUCTION

This Technical Report presents the results of Phase II of MCR's project for OASD (MRA&L) on the "Cost Implications of Hardware Manpower Balance." In this phase of the project MCR has developed a methodology for estimating unit sustainment manpower costs for major weapon systems.

This section discusses the following topics:

- background of the analysis,
- purpose of the analysis,
- approach taken, and
- organization of this report.

A. BACKGROUND

The Under Secretary of Defense for Research and Engineering has issued policy guidance that manpower impacts will be considered in system design and acquisition. This is a new and expanded consideration of manpower. It requires both OSD and the Services to develop improved methods for evaluating manpower requirements (i.e., quantity and type of manpower) on Service resources.

Weapon systems currently being designed represent, for the most part, an ascending level of both sophistication and, in some cases, complexity. These technological advances have frequently resulted in the increased demand for more costly and skilled manpower specialties to operate and support these systems. The Services are currently experiencing manpower difficulties, in terms of retention of many skill areas, particularly in these costly and critical manpower specialties. In recognition of these difficulties, DoDI 5000.2, "Major System Acquisition Procedures," of 19 March 1980, delineates the manpower analyses the Services must perform in developing the

Decision Coordinating Papers (DCPs) and Integrated Program Summaries (IPSs) required for DSARC review. For DSARC Milestone II, the Services must:

- summarize projected requirements versus projected Service assets in critical career fields;
- identify new occupations which may be required;
- provide a summary by fiscal year and occupation of all formal training requirements for the proposed system, identifying numbers of personnel to be trained and training cost;
- identify the contractor support and depot workload requirements in terms of manhours per end item; and
- identify the net change in total force manpower associated with the proposed system in terms of active forces, reserve forces, and DoD civilians.

These estimates are to be refined by DSARC Milestone III in addition to the following analysis requirements:

- identify shortfalls in meeting requirements by occupation;
- assess the impact on system readiness of failure to obtain required personnel;
- identify new occupations not yet programmed into Service personnel and training systems; and
- summarize plans for attaining and maintaining the required proficiency of operating and support personnel.

These analyses require the Services to specifically address the potential impacts of total system requirements as well as detailed occupational requirements in terms of their projected resources (i.e., money, personnel, time). Therefore, system manpower requirements must be examined in detail from at least the following three aspects:

- The quantity and type of all manpower required directly or indirectly by the weapon system, or the unit in which it will be deployed, must be examined. This includes military, DoD civilian, and contractor personnel.

- The projected requirements for manpower versus projected inventories for manpower (particularly military personnel) must be examined.
- The potential sources of skilled and experienced manpower within the Service who may be available for cross-training or cross-utilization on the system must also be examined.

The primary purpose of these analyses is to call attention to critical occupations which seriously influence system readiness and which have serious projected resource demands or constraints. As part of this overall expansion of early analysis of weapon system manpower requirements, OASD (MRA&L) has tasked MCR to develop methods for evaluating two major aspects of manpower. These are:

- the identification and evaluation of high-cost/critical occupations required for weapon systems; and
- the impact on weapon system manpower costs of the required quantities of particular occupations and pay grades.

In Phase I of this effort a preliminary definition of high-cost/critical occupations and a preliminary initial unit manpower cost methodology were developed. The results of this effort were documented in the final report of Phase I.^{2/}

Phase II of this effort has concentrated on refining and quantifying the application of the definition of high-cost/critical occupations; and developing the unit sustainment manpower cost methodology. A high-cost/critical occupation is defined as one which is essential to accomplish the mission of the weapon system, and/or is costly (because of training or retention requirements). Inventory shortage is not sufficient, by itself, to qualify an occupation as high-cost/critical. This definition attempts to reflect the different applications of this term used by the respective Services.

2/ TR-8006-1, "Cost Implications of Hardware Manpower Balance: Phase I - Initial Unit Manpower Cost Methodology," R. McConnell et al., Management Consulting & Research, Inc., Falls Church Virginia, 30 November 1980.

In Phase I, two element structures were developed to categorize manpower requirements and manpower costs. The unit manpower requirements for a weapon system, identified by quantity in a given occupation/pay grade combination, were costed. This was accomplished by applying the occupation- and pay grade-specific costs, listed in the cost element structure, to the detailed unit manpower requirements.

In Phase II, the calculations using these element structures have been refined by including consideration of personnel loss and replacement. The costs calculated by this approach are related to sustaining the unit and are comparable to the manpower operating and support costs calculated by the Services. Unit sustainment factors, developed from Service personnel loss rates, are applied to the recurring manpower costs.

In originally developing the definition of high-cost/critical occupation and the unit manpower cost methodology, MCR considered application of these methods in terms of DSARC Milestone III or IIIA submissions. Further consideration has indicated that such analysis should be completed by DSARC Milestone II, when decisions can still be made which will affect the quantity and quality of manpower required by a new system. By DSARC Milestone II the Services have usually developed preliminary estimates of weapon system manpower requirements. Analysis of these preliminary estimates will permit identification of occupations which may present difficulties in the future. These difficulties may be due to systems requiring one or more of the following:

- extremely specialized training which severely restricts choices of assignments;
- occupations which currently have severe inventory shortfalls and are projected to have them in the foreseeable future;
- more expensive training in already expensive career fields; and
- disproportionately large numbers of high pay grade personnel, especially in occupations with inventory problems in certain pay grades.

The methods proposed for defining high-cost/critical occupations and costing unit manpower are designed to help address certain aspects of these problems.

B. PURPOSE

The purpose of this technical report is to document MCR's Phase II efforts concerning the "Cost Implications of Hardware Manpower Balance." This phase has involved six major areas of effort:

- refining the definition of high-cost/critical occupations;
- refining the initial unit test data and element structures;
- developing a unit sustainment manpower cost methodology;
- testing the methodology on selected weapon system unit manpower data;
- joining initial unit and sustainment costs into a manpower life cycle cost methodology for weapon systems; and
- identifying potential applications of these methods.

This phase has involved eight tasks collectively concerned with these areas.

C. APPROACH

The approach taken in this effort has involved building on the foundation of the methods developed in Phase I. In addition to refining the definition of high-cost/critical occupations, and the initial unit test data and element structures, the research into Service approaches has been expanded. The initial approach taken in this effort was to examine the methods used by the Army, Navy, and Air Force in considering critical occupation requirements and weapon system unit manpower costs. A major weapon system from each of the Services was selected to test the methods. The systems selected were:

- Army M-1,
- Navy LAMPS Mk III, and
- Air Force GLCM.

Each of these systems is approaching DSARC Milestone III or IIIA. In testing both the Phase I and Phase II methods, only organizational or unit mission manpower has been used. Intermediate Maintenance, Installation Support and Indirect Personnel have not been considered. The intent of this testing was twofold:

- to demonstrate the high-cost/critical occupation definition; and
- to compare results of using the MCR method of unit costing versus the Service methodologies.

Finally, the requirements of the Integrated Program Summaries are discussed. This is followed by suggested applicability of the two MCR methods (high-cost/critical occupation definition and unit manpower costs) to these requirements.

D. ORGANIZATION OF THIS REPORT

Following this Introduction are the five remaining sections:

- II. Application of the Definition of High-Cost/Critical Occupations
- III. Description of the Preliminary Unit Sustainment Manpower Cost Methodology
- IV. Unit Sustainment Manpower Cost Data for Selected Weapon Systems
- V. Discussion of the Unit Manpower Life Cycle Cost Methodology
- VI. Application of MCR-Developed Tools

Three appendices are also attached:

- Appendix A - Reference Sources
- Appendix B - Additional Navy Data
- Appendix C - Definitions of Service Manpower Cost Elements

II. APPLICATION OF THE DEFINITION OF HIGH-COST/CRITICAL OCCUPATIONS

This section continues the discussion of weapon system high-cost/critical occupation requirements, begun in Phase I of this project. Two topics are discussed:

- analysis of the high-cost/critical occupation definition; and
- results of applying the definition to specific weapon systems.

A. DEFINITIONAL ANALYSIS

MCR developed a definition of high-cost/critical occupations in Phase I of the current Hardware Manpower Balance project. This required identifying the characteristics of a high-cost/critical occupation. MCR researched the approaches used by the Army, Navy, and Air Force to evaluate critical occupations and determined that no universal definition existed. Rather, an occupation is classified as critical based on the context in which it is considered. Three basic characteristics consistently appeared to be part of these critical classifications:

- the essentiality of the occupation to accomplish the primary function of the weapon system or to achieve acceptable system readiness;
- the costs associated with training or maintaining adequate inventories of the occupation; and
- the inventory shortages in particular pay grades in the given occupation.

These three primary characteristics have been considered in the MCR definition of high-cost/critical occupations. This definition was applied to the three selected weapon systems used to test the manpower cost methodology presented in this report:

- the Army M-1,
- the Navy LAMPS Mk III, and
- the Air Force GLCM.

As part of the Phase II effort, MCR refined the Phase I definition by quantifying the methods for identifying the characteristics of high-cost/critical occupations. In refining the definition of these characteristics, the following changes have been made:

- Mission Essentiality - This is still the least quantifiable of the characteristics and is based on the impact an occupation has on system operational effectiveness or readiness. Initially, in Phase I, this characteristic was recognized on the basis of occupation code (e.g., Navy Rating AD-Aviation Machinist's Mate). It is now determined on the basis of job title (e.g., Power Plant Maintenance) as given in the unit manpower document. This characteristic alone is sufficient to qualify an occupation as high-cost/critical.
- High-Cost - The criteria for classifying an occupation as high-cost is the comparison of the combined costs of enlistment bonus, selective reenlistment bonuses (SRBs) and occupational training to a baseline cost. The baseline costs used in these analyses are the Services' average training costs. Those occupations with occupation-specific costs totalling more than the Services' average training costs qualify as "high-cost." This approach has been used because it allows the recognition of all occupation-specific costs, rather than only selected ones (i.e., only training costs). Although the baseline used in this study may not be the "right" number, the purpose of the high cost analysis is only to indicate "above average" costs. Determination of a "high-cost" occupation is, therefore, dependent on the baseline used in the comparison. Using a higher baseline obviously would result in fewer occupations qualifying as high cost. High-cost should be analyzed in the light of the other two characteristics but is usually sufficient to qualify an occupation as high-cost/critical.
- Inventory Shortage - The basis for determining whether this characteristic contributed to an occupation being high-cost/critical has changed substantially. In Phase I it was determined solely on the basis of award of enlistment or selective reenlistment bonuses (SRBs); it

is now determined based on comparison of authorizations to inventories. SRBs were not found to be an accurate indicator of inventory shortages. Some occupations which have inventory shortages are not awarded SRBs since the shortage may be temporary or the occupation is easily substituted for or is not considered to be critical. Other occupations with relatively insignificant shortages receive SRBs. To remedy this problem, the authorizations and inventories for each pay grade were evaluated to determine if an inventory shortfall existed in required paygrades. An occupation is categorized as having inventory shortages if the authorizations in a required pay grade exceed the inventory by 2.0%. This margin minimizes the sensitivity to fluctuations in authorizations and inventory. The 2.0% threshold was used in this study because analysis of the authorizations and corresponding inventories showed that this was a common break-off point in the occupations and pay grades evaluated. The 2% threshold is not significant in terms of readiness, but is used only as a reasonable value for analysis. Inventory shortage by itself is not sufficient to qualify an occupation as high-cost/critical. It must be considered in light of the mission essentiality of the occupation.

The analysis performed in Phase I of the selected weapon system high-cost/critical occupations has been reevaluated. The three characteristics described above are considered in terms of the quantity of each occupation/pay grade combination. The Phase II evaluation has revealed the need for greater attention to pay grade requirements. This need can be readily understood when viewed in the context of the unit sustainment manpower cost methodology, discussed in Section III.

In reevaluating the occupation/pay grade requirements for each of the systems, in terms of the revised definition, analyses were performed in the following sequence:

- The mission essential occupations were identified based on data available from manpower documents which provide individual job titles.
- The occupation-specific costs (enlistment bonus, SRB, and training) were combined for each occupation required by the weapon system and compared to the applicable Service average training cost. Those occupations with combined costs greater than the

Service average training cost were classified as high-cost occupations. Occupations which are composed of only E-8 and E-9 positions were not included in these high-cost/critical calculations, since their training cost has been previously amortized and they do not receive bonuses or SRBs.

- The overall authorization and inventory for each occupation was determined.
- A matrix of the quantity of each occupation and pay grade combination was produced to display the distribution of requirements and to assist in the analysis of the three characteristics.
- For those occupations which have been classified as mission essential or high-cost, a more discrete evaluation of pay grade authorizations and inventories was conducted to identify specific shortfalls in required pay grades.
- Finally, the occupations were listed which qualified as either high-cost or mission essential, thus being identified as high-cost/critical.

The results of the analyses for the selected weapon systems are presented in the following subsection.

B. RESULTS OF ANALYSES

This section presents the results of MCR's reevaluation of the weapon system high-cost/critical occupation requirements originally performed in Phase I. These analyses represent the application of the revised definition of high-cost/critical occupations, just discussed, which allows a more quantifiable evaluation of system manpower requirements.

The weapon systems evaluated are the same ones examined in Phase I of this project. They each represent a new capability for the particular Service:

- the Army M-1 tank which is replacing the current M60 series;
- the Navy LAMPS Mk III ship weapon system which is augmenting the existing ASW capability provided by the LAMPS Mk I helicopter system; and

- the Air Force GLCM, a member of the cruise missile family, which will augment NATO defenses in Europe.

Because of the differences among these weapon systems, they have been evaluated and discussed individually. Each is considered in terms of the organizational unit in which it will be deployed. The M-1 has been examined in the context of a tank battalion. The GLCM is considered in terms of a flight. The LAMPS Mk III is considered in a somewhat different fashion due to the complexity of the units dedicated to it. Thus, data is provided for the 13 sea detachments included in a standard LAMPS Mk III operational squadron; the shore-based component of the squadron; and the Fleet Readiness Squadron (FRS), which is a totally dedicated training unit. It should be noted that the GLCM data is somewhat tentative as the specific pay grade requirements are still classified. For the purpose of this analysis the manpower was assumed to be distributed between E-4 and E-5 pay grades. This assumption was approved as adequate for analysis by the Air Force.

Each of the three evaluations are centered on the analyses of the organizational units described above. The manpower requirements data are displayed on the five main tables included in each discussion.

The demonstration of the application of this definition on the three systems has highlighted certain points which otherwise might not be exposed. These are summarized below:

- An occupation may be "high-cost" without having an enlistment bonus or SRBs awarded, and, conversely, an occupation may have an enlistment bonus and SRBs awarded and still not qualify as a high-cost occupation, due to low training costs.
- It is not sufficient to look at the total authorizations and inventories for an occupation. The status of specific pay grades must be examined in order to determine real impacts. Quite often shortfalls in more senior pay grades are offset by large inventories in first term pay grades.

- The award of an SRB does not necessarily indicate that an occupation is experiencing an inventory shortfall, and, conversely, the existence of an inventory shortfall does not necessarily mean an SRB is awarded to counteract it.

1. Army - M-1

The Army M-1 main battle tank is to be deployed throughout the world as a replacement for the M60 series of tanks. The primary organizational unit in which it will be deployed is a tank battalion consisting of 511 enlisted personnel. The primary manpower document for this battalion, the Table of Organization and Equipment (TOE), lists 32 occupations or MOSSs spread over 13 Career Management Fields (CMFs). Personnel representing all pay grades between E-3 and E-9 are required, with the largest number in pay grade E-4.

Table II-1 lists the M-1 mission essential occupations. Of the 32 Military Occupational Specialties (MOSSs) required, four are considered mission essential. These MOSSs have been selected based on the job titles provided in the TOE. All are concerned with operating or maintaining the tank.

Table II-2 provides the detailed calculations of the high-cost evaluation of all of the occupations. As mentioned in the table footnotes, in some cases the MOSSs represent aggregations of more than one occupation. The average training cost used was taken from the Army Force Planning Cost Handbook (AFPCH). The AFPCH establishes a value (in FY80 dollars) of \$6,654 as the average cost of initial training. For the purpose of the comparison to average training costs, only the skill digit ten (10) training costs have been used for each MOS. The skill digit is an MOS suffix which relates to pay grades. These costs most closely compare to the recruit and initial training costs averaged in AFPCH. Army costs of training were taken from the MOSB which provides training costs by occupation and skill level.

Table II-1. M-1 MISSION ESSENTIAL OCCUPATIONS

<u>JOB TITLE</u>	<u>OCCUPATION CODE</u>
M-1 Armored Crewman (Tank Commander/Loader/Gunner)	19K
M-1 Tank Driver	19L
M-1 Tank Turret Mechanic	45E
M-1 Tank System Mechanic	63E

Table II-2. M-1 OCCUPATION-SPECIFIC CALCULATIONS (FY80 \$)

Table II-2. M-1 OCCUPATION-SPECIFIC CALCULATIONS (FY80 \$) (Cont'd)

Twenty-nine of the MOSs are listed on this table. The three MOSs not included are 00Z (Command Sergeant Major), an E-1 position; 19Z (Armor Senior Sergeant), an E-8 position (E-8s and E-9s have been excluded from the analysis); and 11C (enlistment NCO), an MOS which begins at grade E-6. Eight MOSs receive enlistment bonuses. In addition, all but two (31W and 31P) of the occupations receiving SRBs receive them in both Zones A (21 months to six years of service) and B (six through ten years of service). Altogether, 15 of the MOSs are receiving SRBs. The third award level, the highest award level assigned, goes to 54E. The total number of occupations which qualified as high-cost was 21. This was based on the comparison of occupation-specific costs to the average training cost of \$6,654.

The second part of the analysis included in this table involves the authorizations and inventories for the occupation. Twenty-one occupations are listed as having inventory shortfalls. These shortfalls, indicated by a "yes" in the column marked "shortfall", may be for the overall occupational inventory (e.g., 11C) or in particular pay grades required by the M-1 (e.g., 05B). The latter case is indicated by a "yes" with four asterisks (****) underneath. Those MOSs which have been classified as mission essential or high-cost, and which have an overall or specific inventory shortfall, are listed on Table II-3. The MOSs with inventory shortfalls which do not meet the criteria and are, therefore, not listed on Table II-3 are 71M, 71L, and 94B. The required pay grades with the specific shortfalls are indicated by a ▲. Only pay grades through E-7 are shown. Pay grades E-8 and E-9 have not been included in this analysis because they are supervisors (not mission essential by the definition used for this study) and their training, bonus, and SRB costs have already been amortized. In order to facilitate this analysis the authorizations and inventories for some related MOSs have been aggregated (e.g., 19F, 19H, 19I, 19K and 19L have been combined).

Table II-3. M-1 OCCUPATION/PAY GRADE-SPECIFIC AUTHORIZATIONS AND INVENTORIES*

OCCUPATION CODE	E-1		E-3		E-4		E-5		E-6		E-7	
	AUTH.	INV.	AUTH.	INV.	AUTH.	INV.	AUTH.	INV.	AUTH.	INV.	AUTH.	INV.
358	1,760	1,911	1,455	1,224▲	736	791	--	--	645	--	--	--
05C	1,332	2,283	2,399	1,704▲	2,043	2,056	364	--	--	--	--	--
112	4,654	4,294▲	3,305	3,347	2,736	2,526▲	735	853	768	544▲	24	24
12F	385	368	253	336	162	117▲	153	108▲	25	25	13	17
165	--	371	640	432▲	638	514▲	149	261	--	--	--	--
13C	3,170	4,311	3,298	2,593▲	1,460	1,461	1,219	1,094▲	594	510▲	1,099▲	1,099▲
198/F/J/K/L	4,821	7,375	4,372	4,800	3,995	3,083▲	3,332	2,661▲	1,127	1,099▲	283▲	283▲
31v	580	973	1,534	795▲	363	510	2,013	1,376▲	771	771	771	771
435	106	416	872	547▲	415	564	--	78	--	--	36	36
455/R	377	605	373	347▲	232	237	--	--	2	--	--	--
455/T	283	401	361	248▲	284	284	417	311	--	--	1	1
541	554	1,393	517	204	1,271	322▲	526	546	465	465	337	337
630	6,124	7,793	9,393	7,686▲	4,006	4,437	1,751	3,614	3,614	3,614	647	647
631	656	1,358	767	975	644	643	271	236▲	236▲	236▲	154	154
637	729	949	1,330	834▲	655	576▲	136	145	262	262	154	154
753	598	1,410	1,056	878▲	2,537	1,497	--	--	--	--	--	--
754	--	--	--	--	--	--	1,756	2,156	1,051	1,051	1,051	1,051
755	4,154	5,714	5,911	4,731▲	3,154	3,464	2,527	1,306▲	1,306▲	1,306▲	911	911
911	472	712	1,436	1,341	1,450	1,450	1,450	1,450	911	911	911	911

* This table presents the pay grade-specific authorization and inventory data for the M-1 occupation. The data are presented by pay grade, or required pay grades, designated by the ▲. The totals which have been included in the table do not necessarily reflect the highest cost item since some items are not listed on this table.

Table II-4 provides an additional perspective of the M-1 battalion manpower requirements. This is a matrix of the distribution of personnel by occupation and pay grade combination. It shows the standard distribution of the majority of personnel in the E-3, -4, and -5 pay grades. The largest quantity of personnel is in CMF 19.

The data in the first four charts is summarized on Table II-5. An analysis of the M-1 tank battalion MOSs shows that 21 of the M-1 MOSs qualify as high-cost/critical (19K/L has been counted as two MOSs). Four (19K, 19L, 45E, 63E) are considered mission essential; all 21 have combined costs above the average and are therefore classified as high-cost; and all but one of the high-cost occupations (63S) have inventory shortfalls in required pay grades. This analysis demonstrates that for the M-1, 65.6% of the occupations qualify as high-cost/critical, or 422 of the 511 personnel (82.6% are in high-cost/critical occupations). Examination of manpower and occupations required in an M-1 tank battalion shows that over half of the personnel (53.6%) are required in the four mission essential occupations (19K, 19L, 45E and 63E).

It appears that the M-1 has a higher maintenance requirement than the M60 series of tank but at the organizational level there is an adequate number of mechanics to handle the workload. The Army position at DSARC III was that direct and general support (DS/GS) maintenance workload does not increase over current levels. For purposes of comparison, the MACRIT^{3/} criteria for the M60 series and the MSRS^{4/} criteria for the M-1 are shown in Table II-6. It should be noted that the

^{3/} Manpower Authorization Criteria, AR 570-2, "Organization and Equipment Authorization Tables," 22 July 1969.

^{4/} "Material Systems Requirements and Specifications," Department of the Army, 10 October 1980.

Table II-4. M-1 PERSONNEL BY OCCUPATION AND PAY GRADE

Table II-5. M-1 ANALYSIS OF HIGH-COST/CRITICAL OCCUPATIONS

OCCUPATION CODE	MISSION ESSENTIAL	HIGH-COST	INVENTORY SHORTFALL	RECOMMENDATION
350	---	X	X	Training cost is above average (E-3, E-4, E-5, bonuses, shortfalls in E-4).
05C	---	X	X	Training cost significant (E-1, E-2); E-4 (shortfall); bonuses.
11C	---	X	X	Bonuses, partial shortfalls in E-3, E-4, and E-5.
12F	---	X	X	Training cost is above average (E-1, E-2, E-3, E-4, E-5, bonuses, shortfalls in E-4).
165	---	X	X	Training cost is above average (shortfalls in E-3, and E-5).
190	---	X	X	Training cost not significant, above average (E-1, E-2, bonuses, partial shortfalls in grades E-2, E-3, and E-4).
137/L	X		X	Training cost above average (E-4, E-5); bonuses, shortfalls in E-3, E-4, and E-5.
227	---	X	X	Training cost is above average (E-1, E-2, E-3, E-4, and E-5).
228	---			Training cost is below average (E-1, E-2, E-3, E-4, and E-5).
232	X		X	Training cost is above average (E-1, E-2, E-3, E-4, and E-5).
242	---			Training cost is above average (E-1, E-2, E-3, E-4, and E-5).

Table II-5. M-1 ANALYSIS OF HIGH-COST/CRITICAL OCCUPATIONS (Cont'd)

OCCUPATION	MISSION, ESSENTIAL COST	MISSON, HIGH-COST		INVENTORY SHORTFALL	INVENTORY SHORTFALL	HIGH-COST CRITICAL COST
		MISSON	HIGH-COST			
542	--	X		X	Training cost, average (+43.7); SRE A and B paid; shortfall in E-5.	yes
542	--		X	X	Inventory shortfall in E-4, E-5 and E-7.	yes
53E	X	X		X	Training cost, average (+55.9); SRE A and B paid; shortfall in E-6 and E-7.	no
53S	--		X	--	Training cost, average (+55.9); SRE A and B paid; no inventory shortfall.	yes
53T	--		X	X	Training cost, average (+55.9); SRE A and B paid; inventory shortfall in E-4, E-5 and E-6.	no
723	--		X	X	Training cost, average (+55.9); SRE A and B paid; shortfall in E-4.	yes
724	--		X	X	Inventory cost, average (+55.9); SRE A and B paid; shortfall in E-4.	yes
812	--		X	X	SRE paid, shortfall in E-5.	yes
812	--		X	X	Training cost, average (+43.7); SRE A and B paid; paid; shortfall in E-5.	no

annual organizational maintenance manhours increase above the M60 for M-1, although no additional mechanics are provided. It appears, based on available manhours per mechanic, that the organizational maintenance personnel are adequate for peacetime requirements. The calculation shows that with a peacetime availability factor (annual available hours per mechanic) of 1,590^{5/} for a tank battalion of 54 tanks that

$$\left(\frac{954}{1,590} \times 54 = 32.4 \right)$$

33 mechanics are needed. The M-1 tank battalion has 11 45E and 37 63E for a total of 48 mechanics.

Table II-6. ANNUAL MAINTENANCE MANHOURS PER TANK (PEACETIME OPERATION)

	<u>M-1</u>	M60A1/A3	M60A2
ORG	954	399	569
DS/GS	1,405	1,016	843
TOTAL	2,359	1,415	1,412

The increase in DS/GS required manhours from 1,016 (M60A1/A3) to 1,405 for the M-1 will presumably create a 38% greater requirement for mechanics than are currently authorized. Most of this workload would fall on MOSs 45K and 63H since they do most of the maintenance at the DS/GS level for tanks. The current 45K and 63H authorized strength and inventory are as shown in Table II-7. Both of the MOSs are in short supply, particularly at the journeyman and senior level for 45K (E-4, E-5, E-6) and at the senior level (E-6, E-7) for the 63H. For an operating fleet of 3,763 tanks the increased number of mechanics could be as much as 920 as shown in the calculations below:

5/ TARCOM Report No. ECD-2-79, "Average Maintenance Labor Rates for Tactical and Combat Vehicles," February 1979.

Table II-7. DS/GS OCCUPATION/PAY GRADE-SPECIFIC AUTHORIZATIONS AND INVENTORIES*

OCCUPATION CODE	E-1 - E-3		E-4		E-5		E-6		E-7	
	AUTH.	INV.	AUTH.	INV.	AUTH.	INV.	AUTH.	INV.	AUTH.	INV.
454	222	391	352	240	256	204	425	312	---	2
634	1,667	1,381	1,321	1,025	747	770	840	793	834	714

*Data extracted from COPO-45 Report, MILPERCCN, November 1980.

1,016 (DS/GS annual maintenance manhours) x 3,763 tanks
1,590 (availability factor) = 2,405

1,405 x 3,763 = 3,325

1,590

3,325 - 2,405 = 920

The manpower impact of replacing the M60A1, -A2 and -A3 tank with the M-1 tank is relatively small. The overall number of enlisted personnel in each battalion does not change (511 total). The occupation mix changes to a limited degree, principally by the substitution of M-1-specific operators/maintainers for M60-specific personnel. The substitution initially is accomplished by either on-the-job training (OJT) or short transition courses. The occupations that are currently, or are projected to be, in short supply Army-wide remain the same. The M-1 does not exacerbate problems of occupation-shortages, but it does not alleviate these problems either. Apparently, the M-1 will continue to have the existing problems since the M-1 is a replacement system for the M60 series tank.

2. Navy - LAMPS Mk III

The LAMPS Mk III personnel requirements analyzed in this section represent two different types of organizational units:

- a LAMPS Mk III operational squadron (232 enlisted personnel), composed of:
 - 13 sea detachments, and
 - a shore-based component; and
- a Fleet Readiness Squadron (FRS) (248 enlisted personnel), a stand-alone training unit.

Both of these organizations are totally dedicated LAMPS Mk III units. Current planning calls for eight operational squadrons and two FRSs. A third type of unit is also required by the

LAMPS Mk III, the Aviation Intermediate Maintenance Department (AIMD). Original plans called for five AIMDs to be stationed throughout the world, however, this number may be reduced to four. The AIMDs are discussed only briefly in this analysis for the following reasons:

- all of the occupations required in the AIMD are also required in the operational squadron; and
- they have relatively small numbers of personnel required (a total of 87 enlisted personnel).

Due to the various types of units required by the LAMPS Mk III, and the fact that some are considered mission essential and some support, there is apt to be confusion concerning how each unit is considered in these analyses. In order to minimize this confusion, certain rules have been applied:

- In determining mission essential occupations, only the mission essential units (sea-detachments and AIMDs) were examined. However, the mission essential occupations also occur in the "support" units: the shore-based component of the operational squadron and the FRS.
- In identifying the high-cost occupations, all ratings with occupation-specific costs were examined regardless of the type of unit in which they are required.
- In evaluating the pay grade inventories, the operational squadron and FRS requirements were used in determining if a shortfall existed in a required pay grade.

Table II-8 lists the mission essential occupations. The job titles listed are those in either the sea detachments or AIMD, which were the only units considered by MCR to be mission essential. The occupations also may be found fulfilling different jobs in the shore-based component or the FRS. The LAMPS Mk III requires a total of 23 occupations, with seven pay grades (E-3 through E-9). A total of nine of the occupations were considered mission essential.

Table II-9 presents the high-cost and inventory shortfall calculations, the data for the latter have been

Table II-8. LAMPS Mk III MISSION ESSENTIAL OCCUPATIONS*

<u>JOB TITLE</u>	<u>OCCUPATION CODE</u>
Maintenance/Material Control Coordinator/ Power Plant Maintenanceman	AD
Electrical Instrument Maintenance man	AF
Air Frame Maintenance man (Hydraulics)	AMH
Air Frame Maintenance man (Structures)	AMS
Electronics Maintenance man	AT
Aircrewman	AW
ASW Maintenance man	AX
Armament Repair	AO
Aviators Equipment Repair	PK

*These job titles are for either the sea detachments or the AIMD, the only LAMPS Mk III units classified as Mission Essential. Individuals in these ratings also have other similar jobs in the shore-based component and FRS.

Table 11-9 LAMIS Mk III OCCUPATIONAL-SPECIFIC CALCULATIONS (FY80 \$)

Table II-9. LAMPS Mk III OCCUPATION-SPECIFIC CALCULATIONS (FY80\$) (Cont'd)

OCCUPATION TITLE	OCCUPATION CODE	TRAINING COST**	ENLISTMENT BONUS	SRR (Zone-Level-\$)	HIGH-COST OCCUPATION	AUTHORIZATIONS ***	INVENTORY ****	SHORTFALL
Yeoman Airman/Seaman	YN AN/SN	4,575 3,294	-- --	-- --	No No	11,782 N/A	14,111 N/A	No

obtained from the FY80 FAST model calculations. Fifteen of the 23 occupations are listed on this table with information on training costs, enlistment and selected reenlistment bonuses, authorizations and inventories. The five occupations not included on this table are either positions not related to a specific occupation or rating (APO, PO), or are supervisory ratings which contain only E-8s and E-9s which are not included in this analysis (AF, AM, AV). The occupation-specific costs have been compared to the Navy average training costs (\$5,000 in FY80 dollars) supplied by the Training Resource Model (TRM). The training cost data, also acquired from TRM, represents recruit training and "A" school training only. As with all other Service calculations, bonus data (enlistment and SRS) was taken from current listings. The Navy awards very few enlistment bonuses, with the MS rating (Mess Management Specialist) receiving the only bonus of all the occupations considered. Four of the selected occupations (AT, AW, MS and AX) receive SRSs at varying award levels. Altogether five occupations, of the 18 listed on this table, qualify as high-cost. These are the AX, AT, AW, MS, and PN ratings. In examining the mission essential and high-cost occupations it was found that 11 of the occupations also have inventory shortfalls within required pay grades. The specific authorization and inventory data for these occupations are displayed on Table II-10. Examination of the authorizations and inventories in specific pay grades shows that the first term pay grades E-1 through E-3 have no shortfalls and frequently have large overages. However, almost half of the ratings listed have shortfalls in the E-4 grade and all of the ratings have shortfalls in pay grade E-5. Finally, pay grades E-6 and E-7 show shortfalls in seven of the ratings.

The detailed distribution of personnel by occupation and pay grade combination for an operational squadron and an FRS is contained in Table II-11. Detailed breakdowns of the personnel in the sea detachments, the shore-based component,

Table II-10. LAMPS Mk III OCCUPATION/PAY GRADE-SPECIFIC AUTHORIZATIONS AND INVENTORIES*

| OCCUPATION CODE | A-AW | E-1 | E-3 | E-4 | E-5 | E-6 | E-7 | E-8 | E-9 | E-10 | E-11 | E-12 | E-13 | E-14 | E-15 | E-16 | E-17 | E-18 | E-19 | E-20 | E-21 | E-22 | E-23 | E-24 | E-25 | E-26 | E-27 | E-28 | E-29 | E-30 | E-31 | E-32 | E-33 | E-34 | E-35 | E-36 | E-37 | E-38 | E-39 | E-40 | E-41 | E-42 | E-43 | E-44 | E-45 | E-46 | E-47 | E-48 | E-49 | E-50 | E-51 | E-52 | E-53 | E-54 | E-55 | E-56 | E-57 | E-58 | E-59 | E-60 | E-61 | E-62 | E-63 | E-64 | E-65 | E-66 | E-67 | E-68 | E-69 | E-70 | E-71 | E-72 | E-73 | E-74 | E-75 | E-76 | E-77 | E-78 | E-79 | E-80 | E-81 | E-82 | E-83 | E-84 | E-85 | E-86 | E-87 | E-88 | E-89 | E-90 | E-91 | E-92 | E-93 | E-94 | E-95 | E-96 | E-97 | E-98 | E-99 | E-100 | E-101 | E-102 | E-103 | E-104 | E-105 | E-106 | E-107 | E-108 | E-109 | E-110 | E-111 | E-112 | E-113 | E-114 | E-115 | E-116 | E-117 | E-118 | E-119 | E-120 | E-121 | E-122 | E-123 | E-124 | E-125 | E-126 | E-127 | E-128 | E-129 | E-130 | E-131 | E-132 | E-133 | E-134 | E-135 | E-136 | E-137 | E-138 | E-139 | E-140 | E-141 | E-142 | E-143 | E-144 | E-145 | E-146 | E-147 | E-148 | E-149 | E-150 | E-151 | E-152 | E-153 | E-154 | E-155 | E-156 | E-157 | E-158 | E-159 | E-160 | E-161 | E-162 | E-163 | E-164 | E-165 | E-166 | E-167 | E-168 | E-169 | E-170 | E-171 | E-172 | E-173 | E-174 | E-175 | E-176 | E-177 | E-178 | E-179 | E-180 | E-181 | E-182 | E-183 | E-184 | E-185 | E-186 | E-187 | E-188 | E-189 | E-190 | E-191 | E-192 | E-193 | E-194 | E-195 | E-196 | E-197 | E-198 | E-199 | E-200 | E-201 | E-202 | E-203 | E-204 | E-205 | E-206 | E-207 | E-208 | E-209 | E-210 | E-211 | E-212 | E-213 | E-214 | E-215 | E-216 | E-217 | E-218 | E-219 | E-220 | E-221 | E-222 | E-223 | E-224 | E-225 | E-226 | E-227 | E-228 | E-229 | E-230 | E-231 | E-232 | E-233 | E-234 | E-235 | E-236 | E-237 | E-238 | E-239 | E-240 | E-241 | E-242 | E-243 | E-244 | E-245 | E-246 | E-247 | E-248 | E-249 | E-250 | E-251 | E-252 | E-253 | E-254 | E-255 | E-256 | E-257 | E-258 | E-259 | E-260 | E-261 | E-262 | E-263 | E-264 | E-265 | E-266 | E-267 | E-268 | E-269 | E-270 | E-271 | E-272 | E-273 | E-274 | E-275 | E-276 | E-277 | E-278 | E-279 | E-280 | E-281 | E-282 | E-283 | E-284 | E-285 | E-286 | E-287 | E-288 | E-289 | E-290 | E-291 | E-292 | E-293 | E-294 | E-295 | E-296 | E-297 | E-298 | E-299 | E-300 | E-301 | E-302 | E-303 | E-304 | E-305 | E-306 | E-307 | E-308 | E-309 | E-310 | E-311 | E-312 | E-313 | E-314 | E-315 | E-316 | E-317 | E-318 | E-319 | E-320 | E-321 | E-322 | E-323 | E-324 | E-325 | E-326 | E-327 | E-328 | E-329 | E-330 | E-331 | E-332 | E-333 | E-334 | E-335 | E-336 | E-337 | E-338 | E-339 | E-340 | E-341 | E-342 | E-343 | E-344 | E-345 | E-346 | E-347 | E-348 | E-349 | E-350 | E-351 | E-352 | E-353 | E-354 | E-355 | E-356 | E-357 | E-358 | E-359 | E-360 | E-361 | E-362 | E-363 | E-364 | E-365 | E-366 | E-367 | E-368 | E-369 | E-370 | E-371 | E-372 | E-373 | E-374 | E-375 | E-376 | E-377 | E-378 | E-379 | E-380 | E-381 | E-382 | E-383 | E-384 | E-385 | E-386 | E-387 | E-388 | E-389 | E-390 | E-391 | E-392 | E-393 | E-394 | E-395 | E-396 | E-397 | E-398 | E-399 | E-400 | E-401 | E-402 | E-403 | E-404 | E-405 | E-406 | E-407 | E-408 | E-409 | E-410 | E-411 | E-412 | E-413 | E-414 | E-415 | E-416 | E-417 | E-418 | E-419 | E-420 | E-421 | E-422 | E-423 | E-424 | E-425 | E-426 | E-427 | E-428 | E-429 | E-430 | E-431 | E-432 | E-433 | E-434 | E-435 | E-436 | E-437 | E-438 | E-439 | E-440 | E-441 | E-442 | E-443 | E-444 | E-445 | E-446 | E-447 | E-448 | E-449 | E-450 | E-451 | E-452 | E-453 | E-454 | E-455 | E-456 | E-457 | E-458 | E-459 | E-460 | E-461 | E-462 | E-463 | E-464 | E-465 | E-466 | E-467 | E-468 | E-469 | E-470 | E-471 | E-472 | E-473 | E-474 | E-475 | E-476 | E-477 | E-478 | E-479 | E-480 | E-481 | E-482 | E-483 | E-484 | E-485 | E-486 | E-487 | E-488 | E-489 | E-490 | E-491 | E-492 | E-493 | E-494 | E-495 | E-496 | E-497 | E-498 | E-499 | E-500 | E-501 | E-502 | E-503 | E-504 | E-505 | E-506 | E-507 | E-508 | E-509 | E-510 | E-511 | E-512 | E-513 | E-514 | E-515 | E-516 | E-517 | E-518 | E-519 | E-520 | E-521 | E-522 | E-523 | E-524 | E-525 | E-526 | E-527 | E-528 | E-529 | E-530 | E-531 | E-532 | E-533 | E-534 | E-535 | E-536 | E-537 | E-538 | E-539 | E-540 | E-541 | E-542 | E-543 | E-544 | E-545 | E-546 | E-547 | E-548 | E-549 | E-550 | E-551 | E-552 | E-553 | E-554 | E-555 | E-556 | E-557 | E-558 | E-559 | E-560 | E-561 | E-562 | E-563 | E-564 | E-565 | E-566 | E-567 | E-568 | E-569 | E-570 | E-571 | E-572 | E-573 | E-574 | E-575 | E-576 | E-577 | E-578 | E-579 | E-580 | E-581 | E-582 | E-583 | E-584 | E-585 | E-586 | E-587 | E-588 | E-589 | E-590 | E-591 | E-592 | E-593 | E-594 | E-595 | E-596 | E-597 | E-598 | E-599 | E-600 | E-601 | E-602 | E-603 | E-604 | E-605 | E-606 | E-607 | E-608 | E-609 | E-610 | E-611 | E-612 | E-613 | E-614 | E-615 | E-616 | E-617 | E-618 | E-619 | E-620 | E-621 | E-622 | E-623 | E-624 | E-625 | E-626 | E-627 | E-628 | E-629 | E-630 | E-631 | E-632 | E-633 | E-634 | E-635 | E-636 | E-637 | E-638 | E-639 | E-640 | E-641 | E-642 | E-643 | E-644 | E-645 | E-646 | E-647 | E-648 | E-649 | E-650 | E-651 | E-652 | E-653 | E-654 | E-655 | E-656 | E-657 | E-658 | E-659 | E-660 | E-661 | E-662 | E-663 | E-664 | E-665 | E-666 | E-667 | E-668 | E-669 | E-670 | E-671 | E-672 | E-673 | E-674 | E-675 | E-676 | E-677 | E-678 | E-679 | E-680 | E-681 | E-682 | E-683 | E-684 | E-685 | E-686 | E-687 | E-688 | E-689 | E-690 | E-691 | E-692 | E-693 | E-694 | E-695 | E-696 | E-697 | E-698 | E-699 | E-700 | E-701 | E-702 | E-703 | E-704 | E-705 | E-706 | E-707 | E-708 | E-709 | E-710 | E-711 | E-712 | E-713 | E-714 | E-715 | E-716 | E-717 | E-718 | E-719 | E-720 | E-721 | E-722 | E-723 | E-724 | E-725 | E-726 | E-727 | E-728 | E-729 | E-730 | E-731 | E-732 | E-733 | E-734 | E-735 | E-736 | E-737 | E-738 | E-739 | E-740 | E-741 | E-742 | E-743 | E-744 | E-745 | E-746 | E-747 | E-748 | E-749 | E-750 | E-751 | E-752 | E-753 | E-754 | E-755 | E-756 | E-757 | E-758 | E-759 | E-760 | E-761 | E-762 | E-763 | E-764 | E-765 | E-766 | E-767 | E-768 | E-769 | E-770 | E-771 | E-772 | E-773 | E-774 | E-775 | E-776 | E-777 | E-778 | E-779 | E-780 | E-781 | E-782 | E-783 | E-784 | E-785 | E-786 | E-787 | E-788 | E-789 | E-790 | E-791 | E-792 | E-793 | E-794 | E-795 | E-796 | E-797 | E-798 | E-799 | E-800 | E-801 | E-802 | E-803 | E-804 | E-805 | E-806 | E-807 | E-808 | E-809 | E-810 | E-811 | E-812 | E-813 | E-814 | E-815 | E-816 | E-817 | E-818 | E-819 | E-820 | E-821 | E-822 | E-823 | E-824 | E-825 | E-826 | E-827 | E-828 | E-829 | E-830 | E-831 | E-832 | E-833 | E-834 | E-835 | E-836 | E-837 | E-838 | E-839 | E-840 | E-841 | E-842 | E-843 | E-844 | E-845 | E-846 | E-847 | E-848 | E-849 | E-850 | E-851 | E-852 | E-853 | E-854 | E-855 | E-856 | E-857 | E-858 | E-859 | E-860 | E-861 | E-862 | E-863 | E-864 | E-865 | E-866 | E-867 | E-868 | E-869 | E-870 |
<th rowspan
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Table II-11. LAMPS MK III PERSONNEL BY OCCUPATION AND PAY GRADE

1. Operational Squadron

Table II-11. LAMPS Mk III PERSONNEL BY OCCUPATION AND PAY GRADE (Cont'd)

2. Fleet Readiness Squadron

	A	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45	A46	A47	A48	A49	A50	A51	A52	A53	A54	A55	A56	A57	A58	A59	A60	A61	A62	A63	A64	A65	A66	A67	A68	A69	A70	A71	A72	A73	A74	A75	A76	A77	A78	A79	A80	A81	A82	A83	A84	A85	A86	A87	A88	A89	A90	A91	A92	A93	A94	A95	A96	A97	A98	A99	A100	A101	A102	A103	A104	A105	A106	A107	A108	A109	A110	A111	A112	A113	A114	A115	A116	A117	A118	A119	A120	A121	A122	A123	A124	A125	A126	A127	A128	A129	A130	A131	A132	A133	A134	A135	A136	A137	A138	A139	A140	A141	A142	A143	A144	A145	A146	A147	A148	A149	A150	A151	A152	A153	A154	A155	A156	A157	A158	A159	A160	A161	A162	A163	A164	A165	A166	A167	A168	A169	A170	A171	A172	A173	A174	A175	A176	A177	A178	A179	A180	A181	A182	A183	A184	A185	A186	A187	A188	A189	A190	A191	A192	A193	A194	A195	A196	A197	A198	A199	A200	A201	A202	A203	A204	A205	A206	A207	A208	A209	A210	A211	A212	A213	A214	A215	A216	A217	A218	A219	A220	A221	A222	A223	A224	A225	A226	A227	A228	A229	A230	A231	A232	A233	A234	A235	A236	A237	A238	A239	A240	A241	A242	A243	A244	A245	A246	A247	A248	A249	A250	A251	A252	A253	A254	A255	A256	A257	A258	A259	A260	A261	A262	A263	A264	A265	A266	A267	A268	A269	A270	A271	A272	A273	A274	A275	A276	A277	A278	A279	A280	A281	A282	A283	A284	A285	A286	A287	A288	A289	A290	A291	A292	A293	A294	A295	A296	A297	A298	A299	A300	A301	A302	A303	A304	A305	A306	A307	A308	A309	A310	A311	A312	A313	A314	A315	A316	A317	A318	A319	A320	A321	A322	A323	A324	A325	A326	A327	A328	A329	A330	A331	A332	A333	A334	A335	A336	A337	A338	A339	A340	A341	A342	A343	A344	A345	A346	A347	A348	A349	A350	A351	A352	A353	A354	A355	A356	A357	A358	A359	A360	A361	A362	A363	A364	A365	A366	A367	A368	A369	A370	A371	A372	A373	A374	A375	A376	A377	A378	A379	A380	A381	A382	A383	A384	A385	A386	A387	A388	A389	A390	A391	A392	A393	A394	A395	A396	A397	A398	A399	A400	A401	A402	A403	A404	A405	A406	A407	A408	A409	A410	A411	A412	A413	A414	A415	A416	A417	A418	A419	A420	A421	A422	A423	A424	A425	A426	A427	A428	A429	A430	A431	A432	A433	A434	A435	A436	A437	A438	A439	A440	A441	A442	A443	A444	A445	A446	A447	A448	A449	A450	A451	A452	A453	A454	A455	A456	A457	A458	A459	A460	A461	A462	A463	A464	A465	A466	A467	A468	A469	A470	A471	A472	A473	A474	A475	A476	A477	A478	A479	A480	A481	A482	A483	A484	A485	A486	A487	A488	A489	A490	A491	A492	A493	A494	A495	A496	A497	A498	A499	A500	A501	A502	A503	A504	A505	A506	A507	A508	A509	A510	A511	A512	A513	A514	A515	A516	A517	A518	A519	A520	A521	A522	A523	A524	A525	A526	A527	A528	A529	A530	A531	A532	A533	A534	A535	A536	A537	A538	A539	A540	A541	A542	A543	A544	A545	A546	A547	A548	A549	A550	A551	A552	A553	A554	A555	A556	A557	A558	A559	A560	A561	A562	A563	A564	A565	A566	A567	A568	A569	A570	A571	A572	A573	A574	A575	A576	A577	A578	A579	A580	A581	A582	A583	A584	A585	A586	A587	A588	A589	A590	A591	A592	A593	A594	A595	A596	A597	A598	A599	A600	A601	A602	A603	A604	A605	A606	A607	A608	A609	A610	A611	A612	A613	A614	A615	A616	A617	A618	A619	A620	A621	A622	A623	A624	A625	A626	A627	A628	A629	A630	A631	A632	A633	A634	A635	A636	A637	A638	A639	A640	A641	A642	A643	A644	A645	A646	A647	A648	A649	A650	A651	A652	A653	A654	A655	A656	A657	A658	A659	A660	A661	A662	A663	A664	A665	A666	A667	A668	A669	A670	A671	A672	A673	A674	A675	A676	A677	A678	A679	A680	A681	A682	A683	A684	A685	A686	A687	A688	A689	A690	A691	A692	A693	A694	A695	A696	A697	A698	A699	A700	A701	A702	A703	A704	A705	A706	A707	A708	A709	A710	A711	A712	A713	A714	A715	A716	A717	A718	A719	A720	A721	A722	A723	A724	A725	A726	A727	A728	A729	A730	A731	A732	A733	A734	A735	A736	A737	A738	A739	A740	A741	A742	A743	A744	A745	A746	A747	A748	A749	A750	A751	A752	A753	A754	A755	A756	A757	A758	A759	A760	A761	A762	A763	A764	A765	A766	A767	A768	A769	A770	A771	A772	A773	A774	A775	A776	A777	A778	A779	A780	A781	A782	A783	A784	A785	A786	A787	A788	A789	A790	A791	A792	A793	A794	A795	A796	A797	A798	A799	A800	A801	A802	A803	A804	A805	A806	A807	A808	A809	A810	A811	A812	A813	A814	A815	A816	A817	A818	A819	A820	A821	A822	A823	A824	A825	A826	A827	A828	A829	A830	A831	A832	A833	A834	A835	A836	A837	A838	A839	A840	A841	A842	A843	A844	A845	A846	A847	A848	A849	A850	A851	A852	A853	A854	A855	A856	A857	A858	A859	A860	A861	A862	A863	A864	A865	A866	A867	A868	A869	A870	A871	A872	A873	A874	A875	A876	A877	A878	A879	A880	A881	A882	A883	A884	A885	A886	A887	A888	A889	A890	A891	A892	A893	A894	A895	A896	A897	A898	A899	A900	A901	A902	A903	A904	A905	A906	A907	A908	A909	A910	A911	A912	A913	A914	A915	A916	A917	A918	A919	A920	A921	A922	A923	A924	A925	A926	A927	A928	A929	A930	A931	A932	A933	A934	A935	A936	A937	A938	A939	A940	A941	A942	A943	A944	A945	A946	A947	A948	A949	A950	A951	A952	A953	A954	A955	A956	A957	A958	A959	A960	A961	A962	A963	A964	A965	A966	A967	A968	A969	A970	A971	A972	A973	A974	A975	A976	A977	A978	A979	A980	A981	A982	A983	A984	A985	A986	A987	A988	A989	A990	A991	A992	A993	A994	A995	A996	A997	A998	A999	A1000	A1001	A1002	A1003	A1004	A1005	A1006	A1007	A1008	A1009	A10010	A10011	A10012	A10013	A10014	A10015	A10016	A10017	A10018	A10019	A10020	A10021	A10022	A10023	A10024	A10025	A10026	A10027	A10028	A10029	A10030	A10031	A10032	A10033	A10034	A10035	A10036	A10037	A10038	A10039	A10040	A10041	A10042	A10043	A10044	A10045	A10046	A10047	A10048	A10049	A10050	A10051	A10052	A10053	A10054	A10055	A10056	A10057	A10058	A10059	A10060	A10061	A10062	A10063	A10064	A10065	A10066	A10067	A10068	A10069	A10070	A10071	A10072	A10073	A10074	A10075	A10076	A10077	A10078	A10079	A10080	A10081	A10082	A10083	A10084	A10085	A10086	A10087	A10088	A10089	A10090	A10091	A10092	A10093	A10094	A10095	A10096	A10097	A10098	A10099	A100100	A100101	A100102	A100103	A100104	A100105	A100106	A100107	A100108	A100109	A100110	A100111	A100112	A100113	A100114	A100115	A100116	A100117	A100118	A100119	A100120	A100121	A100122	A100123	A100124	A100125	A100126	A100127	A100128	A100129	A100130	A100131	A100132	A100133	A100134	A100135	A100136	A100137	A100138	A100139	A100140	A100141	A100142	A100143	A100144	A100145	A100146	A100147	A100148	A100149	A100150	A100151	A100152	A100153	A100154	A100155	A100156	A100157	A100158	A100159	A100160	A100161	A100162	A100163	A100164	A100165	A100166	A100167	A100168	A100169	A100170	A100171	A100172	A100173	A100174	A100175	A100176	A100177	A100178	A100179	A100180	A100181	A100182	A100183	A100184	A100185	A100186	A100187	A100188	A100189	A100190	A100191	A100192	A100193	A100194	A100195	A100196	A100197	A100198	A100199	A100200	A100201	A100202	A100203	A100204	A100205	A100206	A100207	A100208	A100209	A100210	A100211	A100212	A100213	A100214	A100215	A100216	A100217	A100218	A100219	A100220	A100221	A100222	A100223	A100224	A100225	A100226	A100227	A100228	A100229	A100230	A100231	A100232	A100233	A100234	A100235	A100236	A100237	A100238	A100239	A100240	A100241	A100242	A100243	A100244	A100245	A100246	A100247	A100248	A100249	A100250	A100251	A100252	A100253	A100254	A100255	A100256	A100257	A100258	A100259	A100260	A100261	A100262	A100263	A100264	A100265	A100266	A100267	A100268	A100269	A100270	A100271	A100272	A100273	A100274	A100275	A100276	A100277	A100278	A100279	A100280	A100281	A100282	A100283	A100284	A100285	A100286	A100287	A100288	A100289	A100290	A100291	A100292	A100293	A100294	A100295	A100296	A100297	A100298	A100299	A100300	A100301	A100302	A100303	A100304	A100305	A100306	A100307	A100308

and the AIMDs are contained in Appendix B. A comparison of the manpower required in the operational squadron and the FRS shows that the operational squadron requires all but one (A) of the ratings, while the FRS requires all but four of the ratings. The operational squadron requires over one-half of its personnel, (162 personnel or 69.8%) in the nine mission essential occupations. This proportion is similar (74 personnel or 58.0%) in the FRS.

In looking at the 13 sea detachments, as described in the draft Navy Training Plan, the pay grade composition for each detachment stays substantially the same. However, the distribution among occupations varies depending on the detachment. Thus, occupational representation may be more critical than pay grade level. The detachment responsibilities are restricted to operation of the helicopter and organizational maintenance. Table II-12 summarizes the preceding four tables on the LAMPS Mk III occupational and pay grade requirements. Eleven ratings were determined to qualify as high-cost/critical. Six of these ratings (AD, AE, AMII, AMS, AO and PR) qualified on the basis of mission essentiality alone. Two of the ratings (MS and AN) qualified on the basis of high-cost only. The remaining three ratings (AT, AW and AX) qualified on both mission essentiality and high-cost. These three ratings are the most expensive LAMPS Mk III ratings to train. Finally, all 11 of the high-cost/critical ratings have inventory shortfalls in required pay grades, with E-5 shortfalls appearing in each of the 11 ratings. The personnel distribution in the high-cost critical occupations for the operational squadron and the FRS is the same as that discussed for Table II-11.

3. Air Force - GLCM

The GLCM is the land-based member of the cruise missile family, planned to be deployed in Europe as part of NATO defenses. The basic organizational unit is the flight.

Table 11-12. LAMPS Mk III ANALYSIS OF HIGH-COST/CRITICAL OCCUPATIONS

MISSION ESSENTIAL	MISSION NON-ESSENTIAL	INVENTORY HIGH-CLASS		INVENTORY SHORT-HALL		REMARKS
		OCUPATION	CLASS	OCUPATION	CLASS	
A-1	X	-	-	X	-	Power plant maintenance; shortfalls in E-4, and F-7.
A-2	X	-	-	X	-	Electrical maintenance; shortfalls in E-4, E-5, and F-7.
A-3	X	-	-	X	-	Hydraulics Maintenance; shortfalls in E-4, F-6, F-7, structures. No instances.
A-4	X	-	-	X	-	Aviation ordnance; shortfalls in E-2, and F-2.
A-5	X	-	-	X	-	Electronics Maintenance; explosive materials, F-2, F-3, and F-5; corrugate W-F-4, E-5, and F-5.
A-6	X	-	-	X	-	Automotive; engine, carburetor, W-F-2, E-3, F-2, F-5.
B-1	X	-	-	X	-	Gas & water distribution system; piping, fittings, valves, etc.
B-2	X	-	-	X	-	Structural; steel, iron, etc., F-2, and F-7.
C-1	-	-	-	X	-	Min. Supply; lamp, gas, etc., E-2, F-2.
C-2	-	-	-	X	-	Food; flour, sugar, coffee, tea, etc., E-2, F-2.

The exact composition of a GLCM flight in terms of occupation and pay grade distribution is still classified. For the purposes of the MCR analysis, personnel have been assigned to the average pay grades of E-4 and E-5. For this reason, some of the more detailed analyses of the GLCM must be considered as tentative.

The minimum direct personnel requirements for a GLCM flight calls for 75 enlisted, non-aircrew personnel. At this time 15 Air Force Specialty Codes (AFSCs) will have new shredouts created: 316XOC (GLCM Missile System Analyst) and 443XOC (GLCM Missile Mechanic) representing new, GLCM-specific skills. Shredouts are alphabetical suffixes to AFSCs and indicate training or qualification on a specific weapon, specific equipment, model, or series. They are indicated by a sixth character appended to the basic five-character AFSC.

Due to the fact that the GLCM will only be deployed in Europe and not in the continental United States (CONUS), it will present unusual personnel management and planning problems, as well as additional costs. Positions for GLCM-specific personnel will be limited to European assignments. In order to be assigned to other units, these personnel will have to undergo some level of retraining. Two of the AFSCs are constrained in this manner: 316XOC and 443XOC. In addition, two other AFSCs (304XO and 461XO) require specialized training which also restricts their assignments to overseas, although not specifically to Europe.

Table II-13 lists the occupations which are considered mission essential for the GLCM. Of the 15 occupations currently under consideration for the GLCM, eight are considered as mission essential. These occupations fulfill jobs which are directly related to the operation, preparation, or maintenance of the system.

Table II-13. GLCM MISSION ESSENTIAL OCCUPATIONS

<u>JOB TITLE</u>	<u>OCCUPATION CODE</u>
Radio Relay Equipment Repairman	304X0
Missile Systems Analyst	316X0C
Avionic Communications Specialist	328X0
Aerospace Ground Equipment Mechanic	423X5
Missile Mechanic	443X0C
Munitions Systems Specialist	461X0
Nuclear Weapons Specialist	463X0
Refrigerator/Air Conditioner Specialist	545X0

Table II-14 gives detailed data on occupation-specific costs, authorizations and inventories for the 15 AFSCs. Based on this data, occupations are classified as being high-cost or having inventory shortfalls. The criteria for classifying an occupation as high-cost in this study is based on the sum of formal training costs and bonus awards compared to the Air Force training cost of \$6,786^{6/}. Those occupations whose costs exceed this baseline are categorized as high-cost. In the case of the GLCM, an occupation may receive an SRB (none receive an enlistment bonus), and still not qualify as high-cost, (e.g., 443X0C). Based on the comparison of combined occupation-specific costs to the Air Force average training cost, eight of the 15 GLCM AFSCs qualify as high-cost occupations. Four of these AFSCs (304X0, 427X4, 463X0, and 472X4) qualify due to the award of an SRB. The remaining four AFSCs (316X0C, 391X0, 461X0, and 811X0) qualify on the basis of their training costs.

Review of the composition of the proposed GLCM flight provides a better indication of the high-cost occupations. Six one of the 75 personnel, or 81.3% of GLCM unit manpower, are in the eight high-cost occupations listed in Table II-14. The percentage is even higher for optimized versions of proposed GLCM manpower requirements.

More information about the 15 AFSCs is provided in an examination of the status of their authorizations and inventories. Fourteen of the AFSCs have inventory shortfalls in specific pay grades. Table II-15 provides additional detail on the status of specific pay grades in the mission essential or high-cost AFSCs. This table shows that for pay grades E-5, E-6 and E-7 there are shortfalls in seven of the 14 AFSCs listed. The

6/ \$6,786 is the enlisted non-aircrew training factor for FY80 used in the Cost Oriented Resource Estimating (CORE) model in AFP 173-13.

Table II-14. GLCM OCCUPATION-SPECIFIC CALCULATIONS (FY80 \$)

Occupation Title	OCCUPATION CODE	TRAINING COST**	Enlistment BONUS	Sgt (base-level)-\$	Enlistment Bonus (base-level)-\$	Highest Cost Occupation	Enlistment Bonus	PARTIAL PAY	SUCCESSFUL RECRUIT
Radio Relay Equipment Repairer	339X2*	6,492	--	A-2 \$5,799 B-1 \$2,923	--	2,704	2,825	Yes	***
Writing System Analyst	316XG*	7,349	--	A-1 \$2,699	--	2,203	1,975	Yes	
Automatic Control Spec.	328YU*	5,063	--	--	--	2,150	1,676	Yes	
Network Analysis Spec.	391X9	7,922	--	--	--	E-1 754	Yes		
Network Analyst Spec.	391XG	5,367	--	--	--	2,171	1,952	Yes	
AE Mechanic	423X5*	4,967	--	--	--	7,150	6,574	Yes	
Material Processing Specialist	427X4	4,993	--	A-1 \$2,899	Yes	575	654	Yes	***
Maintenance Mechanic Automobile	443XG*	3,012	--	A-1 \$2,899	Yes	1,973	1,973	Yes	
Maintenance Spec. Automobile	461X6*	7,020	--	--	--	E-1 6,014	5,542	Yes	
Motor Vehicle Driver Automobile	465X5*	3,451	--	--	--	E-1 1,311	1,287	Yes	
Motor Vehicle Operator Automobile	475X6*	4,717	--	A-2 \$5,746 B-1 \$2,923	--	475	474	Yes	
Motor Vehicle Operator Automobile	475XG*	4,437	--	--	--	1,422	1,422	Yes	
Motor Vehicle Operator Automobile	475XH*	6,454	--	--	--	11,543	10,741	Yes	
Motor Vehicle Operator Automobile	475XJ*	7,074	--	--	--	14,733	13,543	Yes	
Motor Vehicle Operator Automobile	475XK*	7,114	--	--	--	14,733	13,543	Yes	

Table I-15. GLCM OCCUPATION/PAY GRADE-SPECIFIC AUTHORIZATIONS AND INVENTORIES*

impact of these shortfalls can not be fully understood since the specific GLCM pay grade structure is classified.

Table II-16 shows the manpower distribution for the 15 AFSCs. Although the pay grade quantities may not be accurate, the occupation quantities are those actually planned. As shown in this table, AFSC 811X0 (Security Specialist) requires by far the largest number of personnel (57%) within the flight. It is also experiencing serious shortfalls in pay grade E-5. The other occupations show a better situation primarily due to the relatively small numbers of personnel required. The largest demand will come from the 316X0 (Missile System Analyst) AFSC, which requires eight enlisted for a single flight. It is currently planned that the personnel who will fill this GLCM-specific shredout will be already experienced personnel from other systems. This is also planned for the other GLCM-specific shredout, 443X0 (Missile Mechanic).

Table II-17 summarizes the information in the preceding four tables. This table shows that 12 of the 15 GLCM AFSCs qualify as high-cost/critical occupations. Of the possible combinations of the three characteristics, only four (304XC, 316X0C, 461X0, and 463X0) qualify in all three categories. Eight of the 12 occupations are mission essential. However, all of these occupations also qualified in at least one of the other two characteristics. Eight of the 12 AFSCs are also high-cost, while all 12 of the AFSCs have inventory shortfalls. It is, of course, not known if these shortfalls are in required pay grades.

C. OBSERVATIONS

The following observations are made based on the analysis of the selected weapon system high-cost/critical occupations:

- The Services tend to consider occupations in terms of the separate characteristics of high-cost/critical (i.e., mission essentiality, cost, inventory

Table II-16. GLCM PERSONNEL BY OCCUPATION AND PAY GRADE

- Average grades are used. Actual grade/skill level information is classified.
- There is no limit to what can be used but not both.

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Table II-17. GLCM ANALYSIS OF HIGH-COST/CRITICAL OCCUPATIONS

OCCUPATION CODE	MISSION ESSENTIAL	HIGH-COST	INVENTORY SHORTFALL	REMARKS
3-A15*	X	X	X	Communications Maintenance; serious inventory shortage in E-4, Zone A and B SRB paid.
3-B15*	X	X	X	Electronic Missile Maintenance; no inventory shortage in E-4 and E-5, but short at E-6 and E-7; SRB Zone A paid.
3-B16*	-	-	X	Communications Maintenance; does not receive SRB although does have inventory shortage.
3-C16	-	X	X	Production Control; slightly above average cost; inventory shortage for E-4, E-5 and E-7.
4-A15	X	-	X	Ground Equipment Maintenance; receives SRB although does have inventory shortage.
4-A16	-	-	X	Metals & Surface Inspection; may run dry at E-4, E-5, and E-6 just fulfilled as high-cost; shortage in E-7 and E-8.
4-B15	-	-	X	Mechanical and Electrical Maintenance; receives SRB inventory shortage; Zone A SRB paid at cost qualified as high-cost.
4-C15	-	X	X	Reactor Preparation; expensive training; difficult preparation; receives SRB at cost.
4-C16	-	X	X	Reactor Preparation; receives SRB at cost.
5-B15	-	-	X	Electrical Maintenance; receives SRB at cost.
5-B16	-	-	X	Electrical Maintenance; receives SRB at cost.
5-C15	-	-	X	Electrical Maintenance; receives SRB at cost.

* Occupations A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z are not critical or mission essential.

shortage) and, therefore, frequently do not obtain an overview of the impact of all three characteristics.

- The profile of high-cost/critical occupations within an organizational unit is influenced substantially by the mission essential occupations required for the particular weapon system. Table II-18 shows the statistics for the M-1, LAMPS Mk I.I, and GLCM produced in this analysis. In the case of the M-1, over half of the battalion personnel are assigned to four M-1-specific mission essential occupations.
- The aspect of occupation-specific costs as another characteristic of weapon system manpower analysis has frequently been overlooked. Table II-18 shows that in the M-1 battalion an extremely large proportion (82.6%) of the personnel are in occupations which are above average in cost. The GLCM flight shows a similar proportion (81.3%). In identifying high-cost occupations, the ultimate selection is dependent on the baseline used in the analysis. In this study the average training cost for each Service has been used as the basis for the comparison.
- The status of an occupation's inventory is frequently used by the Services as an indicator of criticality. However, an inventory shortfall is only of importance if a particular pay grade within an occupation is required by a weapon system. Thus, inventory analysis becomes meaningful only in the context of the requirements of a particular system or organizational unit. The true impact of inventory shortfalls can only be identified on a Service-wide basis for each occupation/pay grade combination.
- The three weapon systems examined have a preponderance of personnel in high-cost/critical occupations. This should not be taken to mean that all systems require large numbers of high-cost/critical personnel. It would be necessary to look at a high percentage of Service weapon systems before any analysis can be made concerning the impact of critical occupations re-

The definition of high-cost, critical occupations can be used to develop a multidimensional analysis of weapon system manpower requirements. A profile for each occupation can be developed based on the three characteristics of the definition. Thus, an occupation would be described in terms of its mission,

Table II-1c. RESULTS OF HIGH-COST/CRITICAL OCCUPATION ANALYSIS

Occupation System	High-Cost/Critical		Mission Essential		High-Cost		Infringement Potential	
	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
1. <i>High Cost</i>	21	65.6	4	12.4	21	65.6	4	12.4
2. <i>Cost Critical</i>	21	52.6	27.4	51.6	4.6	27.4	6.9	1.3
3. <i>High Cost/Critical</i>	11	27.2	9	30.1	6	27.2	11	4.3
4. <i>Cost Critical</i>	171	12.7	16.7	69.6	71	12.7	22.4	2.7
5. <i>High Cost</i>	12	30.6	8	53.3	8	30.6	12	3.0
6. <i>Cost Critical</i>	71	34.7	75	32.3	61	34.7	71	22.7

* Total for all identified systems.

essentiality, costs, and inventory status in relation to the number of people the weapon system requires in that environment.

To illustrate the multidimensional aspects of the problem, a profile of the LAMPS Mk III system is provided in Table 11-1. As can be seen from the table, a LAMPS Mk III operational squadron requires 29 personnel in the mission essential AN (Aviation) Anti-submarine Warfare Operator, rating, and 27 AWs in the FRS. Based on current plans, which call for eight operational squadrons and two FRSSs, this translates into a total LAMPS Mk III requirement of 286 AWs (or 12.1% of the total 2,361 personnel required in these units).

In terms of the second element, high-cost, the AW rating has very large costs attached to it: a training cost of \$7,501, which is 35% over the Navy average training cost; and SABs awarded in Zone A (\$10,416) and Zone B (\$9,778). These costs, when examined in the context of the total unit, show that the AW-specific annual costs for the operational squadron account for \$114,082, or 24.7% of the total annual occupation-specific unit sustainment costs of \$462,504. Finally, the AW rating is experiencing inventory shortfalls in the four pay grades required in the LAMPS Mk III squadrons: E-4, E-5, E-6, and E-7. This multidimensional analysis allows the examination of the weapon system unit manpower requirements in terms of the characteristics which influence the sustainability of the system.

Table II-19. PROFILE OF THE AW RATING FOR
THE LAMPS MK III WEAPON SYSTEM

- Manpower Requirements by Squadron:

	<u>TOTAL</u>	<u>MISSION ASSISTANT</u>	<u>AN</u>
Oper. Sqdn.	232	162	29
FRS	248	144	27

- Annual Costs by Squadron:

	<u>TOTAL COST</u>	<u>OCCUPATION-SPECIFIC</u>	<u>AN</u>
Oper. Sqdn.	\$4,731,156	\$462,504	\$114,082
FRS	4,940,169	425,630	65,426

- Authorizations and Inventory (E-4 through E-7) for AW Rating:

<u>CURRENT AUTHORIZATIONS</u>	<u>CURRENT INVENTORY</u>	<u>REQUIREMENTS FOR LAMPS MK III AW</u>
2,545	2,012	286

III. DESCRIPTION OF THE PRELIMINARY UNIT SUSTAINMENT MANPOWER COST METHODOLOGY

This section presents:

- a general discussion of the initial unit manpower cost methodology and its relationship to the unit sustainment manpower cost methodology;
- a brief description of Service manpower life cycle cost methodologies; and
- a description of the preliminary unit sustainment manpower cost methodology.

A. GENERAL

As part of the effort in support of the CASS (MANBAL) Hardware Manpower Balance project, MCR has developed a manpower cost methodology. The methodology is intended to provide OSD with an independent means of calculating manpower cost for new weapon systems. The methodology calculates two types of manpower costs incurred over a weapon system's life cycle: initial unit and unit sustaining costs. These costs are calculated in the context of the units in which the systems are, or will be, deployed. The unit is defined as the primary organizational entity (i.e., battalion, squadron, flight) to which manpower is assigned for a specific weapon system.

Initial manpower costs occur as a result of acquiring manpower for the system. Specifically, these are the costs of recruiting, bonuses, and training of personnel by the services. In the context of the units in which the systems are deployed, MCR has identified these costs as initial unit manpower costs. These are the one-time costs for personnel prior to joining a unit. In fact, these costs can occur prior to a system being fielded. In effect, these are the costs of having personnel available to be assigned to the units. These same costs, however, as a function of personnel attriting from the Services, and, therefore, are also part of the unit sustainment costs.

Sustaining costs of manpower occur over the operational life of the system. In the context of the units in which the systems are deployed, MCR has identified these costs as sustainment manpower costs. Specifically, these costs include the recurring costs of recruitment, bonuses, unit activations, pay and allowances; permanent change of station; personnel support and retirement.

The initial and sustaining costs described above represent the total unit manpower costs of a weapon system over the life cycle. However, before manpower costs can be determined, manpower requirements (i.e., personnel to be costed, must be developed. Each of the Services approaches estimating weapon system manpower requirements differently. These approaches are based on the operational structure of the Service; characteristics of the generic type of weapon system being analyzed (e.g., aircraft, ship, tracked vehicle); and the DSARC phase of the system (e.g., full-scale development). As part of the Phase I effort to develop the initial unit manpower cost methodology, MCR developed a manpower strength element structure identifying types of manpower associated with weapon systems. The element structure is compatible with those used by the Services and the CAIC. These manpower strength elements are used in both the initial unit and unit sustainment cost methodologies. The manpower strength element structure developed in Phase I of this effort has been modified based on comments received on the Phase I final report. Specifically, the "Training Support" element of the "Indirect Personnel Support" element has been deleted.

The MCR manpower cost element structure has also been revised based on review and analysis of the Phase I final report. The structure is now identified in terms of those costs associated with acquiring initial unit manpower and those associated with sustainment of unit manpower.

The unit sustainment cost methodology presented in this section is designed to be compatible with Service manpower cost methodologies, which are briefly reviewed in the next section. More detailed descriptions have been provided in the final report of the Phase I effort.

The MCR methodology allows for the calculation of occupation-specific and pay grade-specific manpower costs within the organizational unit. The methodology also allows for the calculation of other manpower costs outside the organizational unit (i.e.; intermediate maintenance, installation support, and indirect personnel support). In the interests of simplicity, since our purpose is only to demonstrate the use of the methodology, the cost data provided in Section IV of the report has been calculated only for enlisted personnel within the organizational unit.

B. SERVICE MANPOWER COST METHODOLOGIES

This section briefly describes the Service methodologies for calculating weapon system manpower costs in the following order:

- the Army methodology,
- the Navy methodology, and
- the Air Force methodology.

As part of the DSARC process the Services are required to develop two life cycle cost estimates:

- the Baseline Cost Estimate (BCE), and
- the Independent Parametric Cost Estimate (IPCE).

The latter is also sometimes called the Independent Cost Analysis (ICA). Development of the BCE is the responsibility of the Program Manager. The IPCE is developed by the Service staffs.

In costing weapon system manpower the Army, Navy, and Air Force each use similar approaches. All Services calculate a

cost per weapon system (i.e., cost per single item). The Navy and Air Force cost all manpower in the primary organizational entity or unit. The Army, since more than one weapon system can be found in a single organization or unit, allocates the manpower in the unit to the various weapon systems found therein. All Services develop a total number of unit mission officer and enlisted personnel. Annual pay factors are used to calculate pay and allowances costs. Usually, average annual training costs are calculated with the remaining annual costs determined using per capita cost factors. The total annual manpower costs for the weapon system are then multiplied by the number of years of the system's life cycle. Historically, the Services have not usually calculated costs using occupation- and pay grade-specific cost factors. Each Service cost methodology is summarized below.

1. Army Cost Methodology

The Army has several ways to estimate weapon system personnel operating and support costs.^{7/} These are briefly described below.

- Average numbers of crew, maintenance, and indirect personnel for each of the items of equipment are combined with the cost of an average crewman, maintenance specialist, or indirect person to determine the cost of operating one item for one year. The resultant cost is multiplied by the average annual operating quantity (the operating fleet) and the service life of the system to obtain the total life cycle personnel operating and support costs. This is currently the most common method of personnel costing and was used for the Baseline Cost Estimate for the M-1.
- Cost Estimating Relationships (CERs) are developed to estimate the personnel-related costs of the system.

^{7/} Report DCA-R-15 ARMY LIFE CYCLE COST MODEL Volume II, "Users Guide to the Tactical Personnel Sub-Model." Unitled supplement to the Army Life Cycle Cost Model Users Guide (14 May 1979), Department of the Army (DACA-CAS), Washington, D.C.

Accuracy of such relationships, however, depends upon the uncertainty surrounding the CEM and the similarity of the CER data base to the system of interest.

- Using the Tables of Organization and Equipment (TOE), or Tables of Distribution and Allowances (TDA), the annual cost of personnel is computed by determining the number of personnel in each deployed TOE or TDA, aggregating the personnel by pay grade and MOS over all TOE/TDA in the system deployment plan, and applying costs by pay grade and MOS to determine annual operating and support personnel costs. Of the three alternatives, this is the most detailed, the most demanding in terms of knowledge about the personnel structure of the Army supporting the system, the most complete in terms of audit trail, the most closely related to the Army's way of force design, and the one most adaptable to sensitivity analysis. The personnel sub-model operated by the Cost Analysis Directorate follows this third approach. Using a series of input files, the model calculates and displays the number of personnel supporting the system by both pay grade and/or MOS to accumulate annual costs of pay and allowances, Permanent Change of Station (PCS), personnel replacement, the pro-rated share of the transient, patient, and prisoner assets, the pro-rated share of recurring (variable) Army supply support operations, recurring (variable) medical support, recurring (variable) quarters, maintenance and utilities, BASOPS support, recurring (variable) administrative support, recurring (variable) unit equipment, and recurring (variable) theater allowances.

The Army generates two major cost documents for the ASARC/DSARC process: the Baseline Cost Estimate (BCE) and the Independent Parametric Cost Estimate (IPCE). The Program Manager is responsible for developing the BCE, although other analytical groups may actually develop the estimate. The Office of the Comptroller of the Army (OCA), Cost Analysis Directorate, is the developer of the IPCE. Each of these organizations may use any of several possible models to develop these estimates. The particular methodology used to develop these cost estimates may require data not included in formal manpower, training, and logistics documents. When this occurs, the cost estimators

contact the various commands and activities, as necessary, for additional data. Manpower cost estimates, while dependent on manpower requirements estimates, are developed separately.

The BCE and the IPCE include manpower costs according to the specific cost categories of the Army cost breakdown structure shown in Table III-1. Definitions of the elements are provided in Appendix C. The entire cost breakdown structure, as well as detailed direction on developing life cycle costs, is provided in DA PAMPHLET 11-4, "Operating and Support Cost Guide for Army Materiel Systems," April 1976.

In costing manpower for weapon systems within the unit, the Army follows a procedure of assigning direct personnel (e.g., crew) and allocating direct maintenance personnel and indirect personnel to the weapon system. Thus, the Army does not cost the entire battalion but only those directly associated with the weapon system. The personnel procedure reflects crew, maintenance, and indirect personnel requirements, and costs are largely derived on the basis of cost factors from the Army Force Planning Cost Handbook (AFPCN). In order to provide a total system cost, each military personnel cost element must also be multiplied by the total number of operational weapon systems and the total number of years in the life cycle. This procedure is normally used for all weapon system costing by the Army.

This data is combined with other data (e.g., Tentative Basis of Issue Plan) obtained from the commands and activities on an "as needed" basis. The cost data necessary to satisfy the Army cost breakdown structure elements is then calculated using:

- "in-house" Cost Estimating Relationships (CERs) and cost factors;
- estimates derived by analogy with other systems (e.g., the M60 and the M-1); and
- costs added as throughput.

Table III-1. COST BREAKDOWN STRUCTURE ELEMENTS
FOR ARMY MATERIEL SYSTEMS APPLICABLE
TO MANPOWER*

<u>Element Number</u>	<u>Cost Element</u>
3.0	Operating and Support
3.01	Military Personnel
3.011	Crew Pay and Allowances
3.012	Maintenance Pay and Allowances
3.013	Indirect Pay and Allowances
3.014	Permanent Change of Station (PCS)
3.03	Depot Maintenance
3.031	Labor
3.05	Other Direct Support Operations
3.051	Maintenance, Civilian Labor
3.06	Indirect Support Operations
3.061	Personnel Replacement
3.062	Transients, Patients and Prisoners (TPP)
3.063	Quarters, Maintenance and Utilities (QMU)
3.064	Medical Support
3.065	Other Indirect

* DA PAMPHLET 11-4, "Operating and Support Cost Guide for Army Materiel Systems," Department of the Army, April 1976.

Various "ground rules" or costing assumptions are also noted. Relevant assumptions include:

- peacetime operation;
- planned milestone schedule;
- FY dollars used in calculations;
- O&S training (equipment) costs which are included in cost of replacement personnel training; and
- operating fleet theater deployment (e.g., CONUS and Europe for the M-1).

Although parametric methods are expressly required in producing the IPCE, they are not necessarily excluded from consideration in producing the BCE. A major difference, however, is that the IPCE uses a large integrated parametric model. Usually, the model is the Army Life Cycle Cost Model (ALCCM). For the M-1, the ALCCM was not used. An alternate model was used, one developed particularly for tracked combat vehicles. This alternate model proved very cumbersome and only a limited number of individuals had the expertise to use it. Because of these deficiencies, the model will not be used for costing the M-1 for DSARC Milestone IIIA.

The manpower and cost data for the M-1 DSARC Milestone III BCE and IPCE were obtained from the Materiel Systems Requirements Specifications (MSRS), the TOE Personnel Sub-model, and the AFPCH. The MSRS provides the basic system parameters including crew/operators, the TOE Personnel Sub-model provides data on the maintenance manpower and indirect manpower, and the AFPCH provides cost factors.

Another source of cost information that will be available for Army weapons system costing is the Operating and Support Cost Management Information System (O&SCMIS). This system is being developed by the Army to provide for centralization of all actual operating and support costs.

2. Navy Cost Methodology

In the Navy, manpower requirements identified in man power and training documents are translated into manpower costs, under direction of the Program Manager (e.g., PMS-NMA 266 for the LAMPS Mk III). For the LAMPS Mk III, the Naval Air Systems Command (NAVAIR) is responsible for actually developing these costs; specifically, NAVAIR 04, the Logistics and Fleet Support Group. These costs are ultimately incorporated into the Decision Coordinating Paper (DCP) and Integrated Program Summary (IPS) presentations made at DShAC. The manpower requirements are also provided to OP-96D, the CNO Resource Analysis Group, which develops the Independent Cost Analysis (ICA) for the program. Both the baseline cost analysis, developed by the PM, and the ICA are presented in the format required by the Cost Analysis Improvement Group (CAIG) for CAIG review before being incorporated into the DCP/IPS.

The basic methodology used by NAVAIR 04 to develop LAMPS Mk III manpower operating and support costs is based on the Navy Resource Model (NARM) methodology. The NARM output is developed from cost factors derived from prior year budget data. OP-90 publishes the NARM methodology and factors annually in the "Navy Program Factors Manual." These factors are used in developing estimates for direct and indirect costs by appropriation: Military Personnel, Navy (MPN) and Operations and Maintenance, Navy (O&MN); for officers and enlisted; for ships and aircraft. The pay base used in the NARM calculations is the aggregated composite standard rate for officers and enlisted used in the FYDP.

For some costs of LAMPS Mk III, NAVAIR 04 modified or developed program-specific factors to be used in place of existing NARM factors. Part of the NARM calculations include the Officer and Enlisted Active Allowances. The allowances serve as the multiplier for calculating personnel costs per

aircraft based on the Navy Training Plan (NTP). A second multiplying factor used in the NARM methodology is a weighting factor developed for officers and enlisted by which the basic pay factors are multiplied. These weighting factors are developed by the Naval Military Personnel Command (NMPC) based on actual pay expenditures for each program element. However, the LAMPS Mk III manpower costs have not been calculated using the weighting factor supplied in the factors manual. Instead, the total pay factor has been used for officer and enlisted.

The basic cost elements and factors included in the NARM for costing aircraft manpower are listed in Table III-2. Definitions of the elements are provided in Appendix C.

Other factors used in the NARM calculations are the indirect officer and enlisted factors. These factors represent the calculated number of personnel required for indirect functions for each platform. These factors are developed by allocating variable support costs to ships and aircraft. The support costs which have been allocated are only those which are assumed to be affected by changes in the numbers of platforms. In other words, the support costs have been calculated based on identification of allocatable support activities. Generally, the following rules have been imposed:

- one third of base operations support costs have been allocated;
- two thirds of staffs and OMN for other selected support activities have been allocated; and
- all students, trainees, transients, patients, and prisoners have been allocated.

The final allocation for indirect costs is for those costs directly related to individual platform types. For each of the support activities, one force-related direct operating

Table III-2. NARM MANPOWER COST ELEMENTS*

Total Direct Operating Manpower (Aircraft)

- Annual Direct MPN
 - Total Officer Direct MPN
 - Officer Active Allowance
 - NARM Officer Pay Factor
 - Officer MPN Weight Factor
 - Total Enlisted Direct MPN
 - Enlisted Active Allowance
 - NARM Enlisted Pay Factor
 - Enlisted MPN Weight Factor
- Annual Direct OMN
 - Annual Air Temporary Additional Duty (TAD)
 - Air TAD Dollars/Person
 - Officer Active Allowance
 - Enlisted Active Allowance

Total Indirect Operating Manpower

- Operating Indirect MPN
 - Indirect Officer MPN
 - Indirect, Officers
 - Base Operations, Officers
 - Recruiting and Examining Activities, Officers
 - Health Activities, Officers
 - Transients, Officers
 - Training Officers
 - Personnel Holding Account, Officers
 - Indirect Officer MPN Factor

* "Navy Program Factors Manual," OPNAV 90P-02C, 31 October 1979.

Table III-2. NARM MANPOWER COST ELEMENTS (cont'd.)

- Permanent Change of Station (PCS), MPN
- Indirect Enlisted MPN
 - Indirect Enlisted
 - Base Operations, Enlisted
 - Recruiting and Examining Activities, Enlisted
 - Health Activities, Enlisted
 - Transients, Enlisted
 - Training, Enlisted
 - Personnel Holding Account, Enlisted
 - Indirect Enlisted MPN Factor
 - Permanent Change of Station (PCS), MPN
- Operating Indirect OMN
 - Logistics OMN
 - Base Operations OMN
 - Training OMN
 - Health Activities OMN
 - Recruiting and Examining Activities OMN

cost was chosen as a proxy for the support activity's workload. Support costs are allocated to each platform based on proportional share of the total proxy related to a particular platform type. In calculating manpower costs for the LAMPS Mk III, the PM has used the original formulas for calculating indirect costs assignable to platform types.

The current schedule calls for initiation of the development of an ICA in February 1981. Therefore, any discussion of the methodology used by OP-960 to develop the ICA is based on the standard procedures. OP-960 intends to use these procedures for the LAMPS Mk III DSARC III ICA. OP-960 uses the Naval Aircraft Operating and Support Cost Estimating Model to develop the independent parametric cost estimate. The model uses CERs, based on parametric relationships, and indirect factors in common with NARM. The cost element structure used for the ICA is shown in Table III-3; definitions are provided in Appendix C. The included elements are those related to manpower costs.

In addition to the two models discussed above, there are several other possible sources of manpower cost data. Currently these sources are not used in developing manpower cost data for DSARC submissions. These sources are briefly described below.

The Navy Training Resource Model (TRM) is a programming model operated by OP-120 to develop training requirements for the Program Objectives Memorandum and other program-related functions. The TRM provides an assessment of the total number of people to be trained within a rating in "A" school (initial skill training) by fiscal year. It also provides the resource impact for both direct mission manpower and indirect (base operations) manpower. The model multiplies manpower by average salary to give a dollar figure for each rating. The TRM model provides a reasonably accurate "A" school training cost for

Table III-3. NAVY COST ELEMENT STRUCTURE*

- Deployed Unit Operations
 - 1. Aircrew (Officers)
 - 2. Aircrew (Enlisted)
 - 3. Combat Command Staff
 - 5. Other Deployed Manpower
 - 6. Air TAD
- Below Depot Maintenance
 - 7. Aircraft Maintenance Manpower
- Installation Support
 - 10. Base Operating Support
- Depot Maintenance
 - 11. Component Rework
 - 12. Airframe Rework
 - 13. Engine Rework
- Depot Supply
 - 14. Depot Supply Operations
 - 15. Technical Support
- Personnel Support and Training
 - 17. Individual Training
 - 18. Health Care
 - 19. Personnel Activities

* Extracted from "Naval Aircraft Operating and Support Costs - Estimating Model FY77 Revision," Administrative Sciences Corporation, February 1977.

each Navy rating which is more precise than the average billet cost provided by the NARM.

The Navy Billet Cost Model (BCM) provides average billet manpower cost by occupation/pay grade combination... It was originally designed to be used in weapon system manpower life cycle costing. However, it is not suitable as data for the MCR-development methodology since individual occupation- and pay-grade-specific costs are not delineated. In addition, certain allocation procedures have been incorporated in the calculation of the cost elements which contribute to the single specified cost, which may not be appropriate for the MCR methodology (i.e., allocation of retirement and training costs).

The Visibility and Management of Operating and Support Costs (VAMOSC) systems for ships and aircraft (VAMOSC-Ships and VAMOSC-Air) provide operating and support (O&S) costs for weapon systems. The systems collect cost data on existing systems for both direct and indirect cost elements to include training costs. However, the training cost is only that unit-related training attributable to the system (e.g., for aircraft systems the cost of fleet readiness squadrons and certain "C" school maintenance courses). The cost of individual training is not included in the training support cost element. The military personnel cost element does not contain individual training costs either. This element only includes pay and allowances.

3. Air Force Cost Methodology

The Baseline Cost Estimate is prepared by the Program Manager and the Independent Cost Estimate by the Product Division of the Air Force Systems Command for the Air Force Cost Analysis Improvement Group of the Air Staff.

The Air Force uses the GS-Cost Analysis Improvement Group (CAIG) cost element structure and definitions for aircraft costing for DSARC presentation. The CAIG cost

Table III-4. AIR FORCE OPERATING AND SUPPORT COST ELEMENT STRUCTURE*

- UNIT MISSION PERSONNEL
 - Aircrew
 - Maintenance
 - Other Unit Personnel
 - Unit Staff
 - Security
 - Remaining Unit Personnel
- DEPOT LEVEL MAINTENANCE
 - Airframe Rework
 - Engine Rework
 - Component Repair
- INSTALLATION SUPPORT PERSONNEL
 - Base Operating Support
 - Real Property Maintenance
 - Medical
- INDIRECT PERSONNEL SUPPORT
 - Misc Operations and Maintenance
 - Medical O&M Non-Pay
 - Permanent Change of Station
- PERSONNEL ACQUISITION AND TRAINING
 - Acquisition
 - Individual Training

* "Aircraft Operating and Support Cost Development Guide," Office of the Secretary of Defense, Cost Analysis Improvement Group, 15 April 1980.

Air Force cost structure. Those elements included in the cost are the manpower costs. The definitions of the manpower cost categories are provided in Appendix C. The definitions are similar to those in the CAIG cost development guide for aircraft operating and support costs. It should be noted that when a missile system is addressed, aircraft/aircrew applies in this case to missile unit operators.

The general manpower cost methodology employed by the Air Force is a life cycle approach tailored to the specific program. Manpower costs are generalized by an average cost approach rather than by one oriented toward specific occupation and/or pay grades. For example, the projected GLCM requirements (officers and enlisted) are multiplied by the respective average officer and enlisted factors to arrive at unit mission personnel costs. The cost estimates derived by this methodology become part of the official cost estimate that is incorporated in the DCP. The manpower estimates for the support requirements are derived by applying factors to the unit mission personnel requirements. Personnel and training costs are developed based on a cost estimating methodology that has factors for acquisition, contractor-provided training, ATC residency, follow-on training, and replacement training. Once the user requirements are known, training costs for each AFSC are developed and fed into a computer model which calculates life cycle personnel acquisition and training costs.

Some other sources of cost information available for Air Force weapons costing are:

- AFP-173-13, "Cost Analysis, USAF Cost and Planning Factors," which has wide application in the estimation of manpower costs. Although it is primarily aircraft oriented, many general cost factors are available. Particularly useful are the costs for acquisition and training by Air Force Specialty Code.
- The Visibility and Management of Operating and Support Cost (VAMOSC II) system is being developed by

the Air Force to provide for the centralization of all operating and support cost analyses. One of the primary uses of the VAMOSC II data base will be to satisfy the operating and support cost requirements for DSARC presentations.

C. DESCRIPTION OF THE PRELIMINARY UNIT SUSTAINMENT MANPOWER COST METHODOLOGY

The MCR unit sustainment manpower cost methodology is designed to calculate manpower operating and support costs for weapon systems within an organizational unit. It is composed of two element structures:

- the manpower strength element structure, and
- the manpower cost element structure with a set of unit sustainment factors.

The manpower strength element structure is designed to identify the categories of direct and indirect personnel associated with a system. The four categories of manpower strength elements are:

- unit mission personnel,
- intermediate maintenance personnel,
- installation support personnel, and
- indirect personnel support.

Cost estimates can be developed for the operational unit, which corresponds to the unit mission personnel, or they can be expanded to include the other categories. No manpower strength element for depot maintenance personnel is included. This is because our primary interest is in military personnel costs with associated critical occupations. Very few military personnel are found in depot level maintenance since most personnel are civilians or contractors. Table III-5 lists the MCR manpower strength element structure.

The second element structure details unit sustainment manpower costs. There are two types of cost elements in this structure:

Table III-5. MCR MANPOWER STRENGTH ELEMENT STRUCTURE

- Unit Mission Personnel
 - Crew/Operators
 - Organizational Maintenance
 - Other Unit Personnel
- Intermediate Maintenance Personnel
- Installation Support Personnel
 - Base Operating Support
 - Real Property Maintenance
 - Medical
- Indirect Personnel Support
 - Individuals
 - Transients
 - Holdées (Prisoners, Patients, etc.)

- recurring acquisition costs, which are recurring costs associated with personnel attrition and replacement, and are calculated using annual personnel loss rates, called here unit sustainment factors; and
- annual unit sustainment costs, which are annual costs related to all of the people in the unit and are based on the estimated manpower requirements of the unit.

These two types of elements are used to calculate the total unit sustainment manpower costs. Table III-6 lists these elements.

The primary difference between the Service methodologies and the methodology proposed here is the use of occupation- and pay grade-specific data to calculate unit costs. The Services generally, but not always, use aggregates for the number of officer and enlisted personnel and the costs. In the MCx methodology the requirements and costs are developed taking into account occupation and pay grade cost impacts.

1. Description of Elements

Descriptions of the manpower strength elements and the manpower cost elements, as they are used in the unit sustainment manpower cost methodology, are presented below.

a. Manpower Strength Elements

- Unit Mission Personnel - these personnel are defined within the context of the primary force unit in which the weapon system is deployed (e.g., squadron, battalion, ship). In order to cost the unit precisely, personnel must be identified by occupation and pay grade. Force unit personnel are generally the crew/operators, maintenance, and all other unit personnel. The maintenance category includes organizational maintenance personnel within the unit.
 - Crew/Operators - full complement of crew/operators required to operate the weapon system of a discrete unit. This element is divided into officers and enlisted. The complete pay grade/occupation structure is used.
 - Organizational Maintenance - all organizational maintenance personnel in support of the weapon system. Maintenance Personnel may be allocated

Table III-6. UNIT SUSTAINMENT MANPOWER COST ELEMENT STRUCTURE

<u>Recurring Acquisition Costs</u>	<u>Annual Unit Sustainment Costs</u>
● General Costs	● General Costs
- Personnel Recruitment	- Permanent Change of Station (PCS)
● Occupation-Specific Costs	● Paygrade-Specific Costs
- Enlistment Bonus	- Pay and Allowances
- Selective Reenlistment Bonus (SRB)	- Retirement
- Training	- Support
	- Incentive and Special Pay

by the Services to individual weapon systems when shared by several weapon systems in a unit.

- Other Unit Personnel - remaining personnel assigned to the unit performing various operational roles (e.g., unit staff, security, administration).
- Intermediate Maintenance Personnel - maintenance personnel outside the unit performing on- and off-equipment maintenance. Officer/enlisted/civilian/contractor total is sufficient detail.
- Installation Support Personnel - personnel not directly assigned to the unit but required for the unit to operate in peacetime. Generally these people are assigned to the installation and would not be required if the unit were moved/deployed. Normally, these are allocated to supported units. Officer/enlisted/civilian/contractor total is sufficient detail.
 - Base Operating Support (BOS) - personnel supporting the operations of the installation and tenant organizations stationed there. Primarily these people provide such functions as communications, supply, services, security (excluding system security), transportation, and administration (e.g., finance, accounting, personnel).
 - Real Property Maintenance (RPM) - personnel assigned to maintenance and operation of real property facilities and related management and engineering support work and services.
 - Medical - medical personnel needed to support the unit at its peacetime location.
- Indirect Personnel Support - the proportionate share of the individuals accounts.
 - Individuals - transients and holdees (patients, prisoners, and personnel awaiting discharge); students and trainees are excluded as their cost is included in the student/trainee pay and allowance portion of training cost. Officer/enlisted total is sufficient detail.

b. Manpower Cost Elements

- Recurring Acquisition Costs - which are recurring costs associated with personnel attrition and replacement, and are calculated using annual personnel requirements, called here unit sustainment factors; and

- General Costs:
 - Personnel Recruitment - the cost of enlisted recruitment and/or officer acquisition. This cost is derived from FY80 budget data from the Five Year Defense Plan data of October 1980. This is also a recurring cost of sustaining manpower and, in that case, is calculated using the unit sustainment recruitment factor which is based on service personnel loss rate data.
- Occupation-Specific Costs:
 - Enlistment Bonus - this is the cost of enlistment bonuses awarded by the Services based on recruiting requirements. It is used as a recruiting inducement for certain occupations. This data is obtained from the Services. It is considered a recurring cost of sustaining unit manpower, dependent upon the rate at which personnel who are eligible to receive the bonus (new accessions) arrive in the unit. This cost is calculated using the unit sustainment enlistment bonus factor. MCR has applied the cost to E-3 authorizations since there are no E-2s authorized on manpower documents.
 - Selective Reenlistment bonus (SRB) - this is the cost of SRBs awarded by the Services based on internal retention requirements. It is used as an inducement to personnel to reenlist in certain occupations in order to retain a required level of experience. This data is obtained from the Services. It is considered a recurring cost of sustaining unit manpower. It depends upon the rate at which the personnel who might receive the SRB (E-4s through E-7s) must be replaced in the unit. This cost is calculated using the unit sustainment SRB factor.
 - Training - this is the cost related to recruit, initial skill and skill progression training. In the case of the Navy, initial skill training costs have been used as a surrogate for the skill progression training costs. These costs are obtained from the Services. It is also a recurring cost of sustaining unit manpower dependent upon

the rate at which new personnel in a given occupation are introduced into the unit. This cost is calculated using the unit sustainment training factor.

- Annual Unit Sustainment Costs - which are annual costs related to all of the people in the unit and are based on the estimated manpower requirements of the unit.
 - General Costs:
 - Permanent Change of Station (PCS) - this is the cost of Permanent Change of Station moves for unit personnel. It is an annual cost calculated by the Services. Service factors are used.
 - Pay Grade-Specific Costs:
 - Pay and Allowances - this cost is applied to each person in the manpower requirements document for the unit. The costs used in this methodology approximate the unadjusted composite standard rate described in the DASD (C) publication "Average Cost of Military and Civilian Manpower in the Department of Defense," August 1980 ("Average Cost Handbook"). The standard rate averages all personnel within a pay grade and includes the total Service Military Personnel (MilPers) appropriation less PCS costs. The adjusted standard rate removes quarters (BAQ), and special allowances, incentive pays and other special pays not available to all the force. It includes base pay, rations (BAS), uniform, FICA, separation (excess leave), and bonuses. The bonus costs are removed from the standard rate and are instead used in the calculation of participation-specific costs. Quarters may need to be added back in to include all pertinent pay/allowances.
 - Retirement - this cost is currently not included in any Service manpower cost methodology. The retirement rates cited in the "Average Cost Handbook" are the ones which have been used in this methodology. Retirement is considered an accrued liability for the ultimate retirement of the current force rather than a current liability in the "Average Cost Handbook." The cost factor often uses military retirement pay (pay to personnel already retired). The services do not yet have

separately for this and, therefore, they usually ignore this cost in their weapon system manpower costing. It is applied as an annual cost to the number of personnel required in each pay grade.

- Support - this is a cost that reflects the cost of providing medical (including dailiness) and other support. MCR has used the costs in the "Average Cost Handbook." This cost is applied to all personnel in each pay grade.
- Incentive and Special Pay - this is an annual cost which may be paid to certain personnel based on Service decisions. Some types of incentive pays are: flight pay, submarine pay and other hazardous duty pays. Examples of special pays are sea pay, proficiency pay, medical pay, and nuclear officer pay. These costs are applied to all personnel who qualify, based on such factors as their occupation, geographical location, or work environment.

2. Definition of Unit Sustainment Factors

In order to use the initial unit manpower cost elements in the unit sustainment manpower cost methodology, factors must be applied. These unit sustainment factors allow for the calculation of the impact of personnel replacement in the costs. They represent the recurring costs related to personnel replacement.

The unit sustainment factors developed by MCR are detailed Service personnel loss rates for specific occupations and pay grades. As with the annual cost factors, the unit sustainment loss rate factors must be updated annually.

The unit sustainment factors are described below. The specific factors developed for the three Services are provided in Section IV.

a. Unit Sustainment Recruitment Factor

The recruitment cost is an average annual cost developed based on Service data. This cost is directly related to personnel loss rates. The factor used is based on the total Service loss rate. Consideration of mental categories and high school graduate status could be used for greater precision, i.e., higher mental categories and high school graduates are more costly to recruit.

b. Unit Sustainment Enlistment bonus Factors

The enlistment bonuses are used by each of the Services to attract qualified personnel into occupations with large first term attrition. A person must meet three basic qualifications in order to be awarded an enlistment bonus for signing up for a particular occupation:

- have a high school diploma,
- score in the top three mental categories, and
- enlist for at least four years.

Not all of the enlisted personnel entering a qualifying occupation receive the enlistment bonus. Thus, a factor based on the percentage of actual awards (vs. those entering the qualifying occupation) must be calculated for each occupation. Where occupation-specific data is not available, Service-wide award data is used. In the case of the Navy and Air Force, where such data is not readily available, the Service-wide E-3 loss rate is used as a surrogate.

c. Unit Sustainment Selective Reenlistment bonus Factors

Selective Reenlistment Bonuses (SRB) are awarded to various occupations. Awards are calculated on the basis of length of service of the reenlistee (correlating to Zone A, B or C), award level and length of obligated service.

The current year SRB award list was used to identify the occupations receiving SRBs, the zone and award level. Costs were calculated in FY80 dollars for consistency with all other calculations in this study. The average pay grade and length of service was determined for each Service and each zone. The base pay for these averages was used as the pay factor and multiplied by the current award level and the average period of reenlistment for each Service. The average reenlistment period was used to determine the frequency of application. The SRB is applied only to the average grade for a particular zone in each Service (e.g., Army Zone A is E-4).

d. Unit Sustainment Training Factors

Training costs are one of the occupation-specific costs calculated as part of the MCR-recommended manpower cost methodology. All of the Services collect training cost data which contain, to varying degrees, the costs associated with training a person in a particular occupation. As discussed in Section II, these costs have been used as the basis for qualifying an occupation as a high-cost field.

In calculating life cycle manpower costs, the cost of providing occupational training to replacement personnel must be considered. Two major questions are raised in calculating these costs:

- How often should training costs be applied?
- What rate of loss should be used?

These two questions are related and are influenced by the data available in each Service. The Services collect and aggregate data differently. The Army has the widest scope of data, collecting training costs by occupation and skill level (which reflects pay grade) and personnel loss rates by occupation and years of service (which can also be related to pay grade). The Army training cost data is for

recruit training, initial skill training, and skill progression training. The Navy collects training costs with no separation. Costs are for recruit training and initial skill, or "A" school, training. Skill progression training, or "B" school, costs are not adequately collected. Loss data for the Air Force is collected by occupation and pay grade combination. Training costs for an occupation reflect all costs associated with any training for the occupation. There is no individual cost for initial skill or skill progression training. Loss rates are calculated for each occupation but are not calculated by total pay grade population.

Because of differing levels of detail of training cost data available from the services, occupation-pay grade-specific loss rates are applied where possible. In the absence of this detail, occupation-specific loss rates are used. The first instance is possible using Army data; the latter case applies to Navy and Air Force data.

3. Procedures for Using the Unit Sustainment Manpower Cost Methodology

Having defined the strength and cost elements, and the unit sustainment factors, the final part of the methodology is the procedure for calculating the costs. The unit sustainment manpower cost methodology simply multiplies cost elements by manpower strength elements to produce manpower costs. Some cost elements are applied in conjunction with loss rates (refined previously as unit sustainment factors). These rates take into account the movement of personnel through units in the normal course of enlistment, active duty, and their separation from the Service. This is a two-part process, outlined below. The first step is to:

- Organize manpower requirements data by occupation/pay grade combination and loss rate factor for each occupation and pay grade. Data may be arrayed by organizational unit (e.g., battalion, squadron, flight).

- Calculate manpower requirements beyond the organizational unit (e.g., intermediate maintenance, installation support and indirect personnel). Specifically, these personnel are identified as an aggregated total of officers and enlisted. MCR has not calculated these requirements since the Service methodology is the same as the MCR methodology.

Table II-4, in Section II, is an example of the unit mission personnel organization for the XM-1 tank Battalion.

Once the unit manpower requirements have been organized by occupation and pay grade and the total number of personnel in each occupation and pay grade have been determined, the analyst can proceed to apply costs to the data. This second part of the process involves a sequence of steps:

- Calculate pay grade-specific costs.

This involves the application of the annual costs (C) which are pay grade-specific (PG) to the number of people in each grade (Q_{PG}). It translates into the following equation:

For PG:

$$(C_{P\&A} + C_{RET} + C_{SPT}) \times Q_{PG} = \text{Total Annual Cost } (TC_{PG})$$

where:

$C_{P\&A}$ = Annual Cost of Pay and Allowances for the specific pay grade;

C_{RET} = Annual Cost of Retirement for the specific pay grade;

C_{SPT} = Annual Cost of Support for the specific pay grade;

Q_{PG} = Quantity of personnel in the specific pay grade.

After calculating the pay grade-specific costs, the next set of costs are determined.

- Calculate occupation-specific costs.

This involves the application of the costs (C) which are occupation (O)-specific to the number of people in each

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occupation (Q_O). In these calculations annual costs are calculated using the unit sustainment factors. This process translates into the following equation:

For Q :

$$[(C_T \times F_{UST}) + (C_E \times F_{USE}) + (C_{SRB} \times F_{USSRB})] \times Q_O \\ = \text{Total Annual Cost } (TC_Q)$$

where:

- C_T = Cost of Training for the specific occupation;
 F_{UST} = Unit Sustainment Training Factor;
 C_E = Cost of Enlistment Bonus for the specific occupation;
 F_{USE} = Unit Sustainment Enlistment Bonus Factor;
 C_{SRB} = Cost of Selective Reenlistment Bonus for the specific occupation;
 F_{USSRB} = Unit Sustainment SRB Factor;
 Q_O = Quantity of personnel in the specific occupation.

There are two costs which are not considered occupation- or pay grade-specific. These are Personnel Recruitment and Permanent Change of Station (PCS). The methodology uses an annual cost for each applied to all personnel. These costs are calculated using the following equations:

For Q :

$$(C_{RCT} \times F_{USR}) \times Q = \text{Total Annual Cost of Recruitment} \\ (TC_{RCT})$$

where:

- C_{RCT} = Annual Average Cost of Personnel Recruitment;
 F_{USR} = Unit Sustainment Factor Recruitment;
 Q = Total quantity of personnel.

and

$$C_{PCS} \times Q = \text{Total Annual Cost of PCS } (TC_{PCS})$$

where:

$$C_{PCS} = \text{Annual Average Cost of PCS.}$$

These two annual average costs can be calculated separately or with either the pay grade-specific or occupation-specific calculations. MCR has chosen to calculate both of these costs with the pay grade-specific costs in order to reduce the number of calculations.

There is another cost which can be either pay grade-specific or occupation-specific. This is incentive and special pay. This is an annual cost which only applies to specific positions. These costs are calculated as follows:

For Q:

$$C_{ISP} \times Q = \text{Total Annual Cost of Incentive and Special Pay (TC}_{ISP}\text{)}$$

where:

C_{ISP} = Annual Cost of Incentive and Special Pay;

Q = Quantity of Personnel receiving Incentive and Special Pay.

MCR has chosen not to include these costs in Section IV since they are applicable only to a limited number of positions or are geographic-dependent (e.g., COLA).

Once all of the above calculations are made, each of the totals is summed producing the total annual manpower costs for the unit in which the system is, or will be, deployed.

The total annual manpower cost for an organization can be identified by the following equation:

$$TC_{PG} + TC_O + TC_{RCT} + TC_{PCS} + TC_{ISP} = TC$$

If TC is multiplied by the number of years of system life and also multiplied by the total number of units/organizations then a total weapon system unit manpower cost can be determined. As mentioned above, $TC_{ISP} = 0$ in the calculations in Section IV.

The next section presents the results of applying this methodology to selected systems and the comparison of these results with Service cost methodologies. Only the unit manpower costs have been calculated since these are the occupation-specific and pay grade-specific costs (or equal across occupations and grades). Manpower costs beyond the organizational unit would be calculated in the same manner as the Services currently do it. This is simply a matter of calculating the number of personnel in the other manpower strength elements and then multiplying by Service average cost factors.

IV. UNIT SUSTAINMENT MANPOWER COST DATA FOR SELECTED WEAPON SYSTEMS

This section presents:

- a description of the general approach used in applying the unit sustainment manpower cost methodology;
- the specific unit sustainment factors for each Service developed by MCR and used in the unit sustainment manpower cost calculations;
- a comparison of M-1 unit manpower costs per tank estimated using the MCR and Army methodologies;
- a comparison of the LAMPS Mk III unit manpower costs estimated using the MCR and Navy methodologies;
- a comparison of GLCM unit manpower costs estimated using the MCR and Air Force methodologies, and
- conclusions based on these comparisons.

A. GENERAL

This section documents the results of applying the MCR-developed unit sustainment manpower cost methodology to three weapon systems, (M-1, LAMPS Mk III, and GLCM). These three weapon systems are also costed using the methodologies currently used by the Army, Navy, and Air Force to develop weapon system manpower costs for DSARC Milestone III.

The objective of this analysis is to compare the results of the MCR and Service methodologies, particularly the impact of using occupation- and pay grade-specific costs. For the purposes of these cost comparisons, only Unit Mission Personnel have been costed. Within the unit, only enlisted personnel have been costed since they are the area of principal interest in demonstrating the methodology using occupation-specific data. As explained in Section III, the costs for the other three manpower strength categories (Intermediate Maintenance, Installation Support, and Indirect Personnel) have not been calculated. The reason for not calculating the two latter categories of personnel is that they are not calculated using occupation- and pay

grade-specific costs. In the case of intermediate maintenance personnel, it was decided that this was not necessary for the purpose of comparing results.

The manpower strength elements and manpower cost elements used in the MCR unit sustainment cost methodology (described in Section III) are shown in Tables III-5 and III-6. The unit sustainment factors, which are applied to the recurring manpower cost elements, have also been described in the preceding section. The specific unit sustainment factors used in the MCR calculations of M-1, LAMPS Mk III, and GLCM annual unit sustainment manpower costs are presented in the next subsection. The Service manpower cost elements, which are comparable to the cost elements in the unit sustainment methodology, are listed in Tables III-1 (Army), III-2 (Navy) and III-4 (Air Force).

The calculations using MCR's unit sustainment manpower cost methodology are organized by those costs which are occupation-specific and those that are pay grade-specific. The details of the weapon system manpower requirements are provided in Section II, in the discussion of high-cost/critical occupations.

In Section III, equations were provided that show how manpower costs are calculated using the MCR-developed methodology once manpower strength is determined. To demonstrate how these equations are used in the calculations in each Service subsection the equations are repeated here as they relate to the two tables provided for each Service. The two tables show pay grade-specific and occupation-specific cost calculations. An example from the M-1 calculations is given for one pay grade (E-7) and one occupation - Army MOS 12F20. The equations used and examples are shown below:

- Pay Grade-Specific Cost Calculations:

$$(C_{P\&A} + C_{RET} + C_{SPT}) \times Q_{PG} = TC_{PG}$$

Example (E-7): $(\$17,928 + \$4,725 + \$1,588) \times 24$
 $= \$581,784$

MCR has chosen to include two other costs on the pay grade-specific tables, these are Personnel Recruitment (C_{RCT}) and Permanent Change of Station (C_{PCS}). Thus, the tables display the following calculation for each pay grade listed (E-3 through E-9):

$$(C_{P\&A} + C_{RET} + C_{SPT} + C_{RCT} + C_{PCS}) \times Q_{PG} = TC_{PG}$$

Example (E-7): $(\$17,928 + \$4,725 + 1,588 + \$391 + \$792) \times 24 = \$610,176$

producing a sum of the total annual cost for unit sustainment costs for each pay grade.

- Occupation-Specific Cost Calculations:

$$[(C_T \times F_{UST}) + (C_E \times F_{USE}) + (C_{SRB} \times F_{USSRB})] \times Q_O = TC_O$$

Example (12F20): $[(\$11,478 \times 0.13) + 0 + (\$3,760 \times 0.20)] \times 1 = \$2,244$

MCR has applied the unit sustainment factors for enlistment bonus (F_{USE}) and SRBs (F_{USSRB}) prior to putting the costs (C_E , C_{SRB}) on the tables. The tables display the data used to produce a total annual unit manpower cost (TC_O) for each occupation listed.

The sum of the costs from these two tables is the total annual unit sustainment manpower cost for the organizational unit. This cost is compared to a similar manpower cost developed using the specific Service methodology.

B. SERVICE UNIT SUSTAINMENT FACTORS

In this subsection brief descriptions of the unit sustainment factors, developed by MCR for use with the MCR methodology, are provided by Service.

1. Army - Unit Sustainment Factors

The Army uses a total Army enlisted loss rate in the calculation of personnel replacement costs. MCR has developed occupation-specific loss factors from Army data:

- Unit Sustainment Recruitment Factor - The Army total attrition factor for enlisted personnel was 24.7% for FY80.^{8/} This is applied to the recurring recruitment cost to derive the annual cost.
- Unit Sustainment Enlistment Bonus Factors. The Army enlistment bonus factor has been calculated in a different way than the Navy and Air Force factors due to the availability of more detailed data. The number of people who actually received bonuses in M-1 required occupations (3,187) has been divided by the number of E-3 authorizations in those MOSS, or the number of people who possibly could have qualified to receive these bonuses (8,054). This calculation produced a factor of 0.4.^{9/}
- Unit Sustainment Selective Reenlistment Bonus Factors - MILPERCEN calculates projected Selective Reenlistment Bonus costs using a five year average reenlistment period and average pay grades and years of Service for each zone.^{10/} In FY80, the average pay grades and years of Service were:
 - Zone A, E-4 with three years service;
 - Zone B, E-5 with eight years service; and
 - Zone C, E-6 with twelve years service.
 MCR has used these same data in the calculations.
- Unit Sustainment Training Factors - The Army collects training cost data by skill level for each MOS and documents this in the MOSB. In order to annualize these costs they must be multiplied by occupation- and skill level-specific annual loss rates. MCR obtained detailed FY80 continuation rates for each Army Career Management Field (CMF) from ODCSPER.^{11/} Continuation rates are the opposite of loss rates and are identified in terms of ranges of years of service (i.e., one to three years, four to six years, seven to ten years, and eleven to twenty years) within each CMF, rather than pay grade. MCR has correlated the average years of service for each pay grade to these data and selected the appropriate loss rate. Several CMFs were used

8/ Annual attrition factors for FY80 received from DACA-CAC, Mr. John Sincavage, taken from Army Force Cost Information System (which is the automated system for the AFPCH).

9/ Information received ffrom MILPERCEN - Military Incentives Management Branch, Mrs. Kristine Farrendino.

10/ MILPERCEN, Monetary Incentives Branch, LTC L.K. Walker.

11/ DAPE-MPE, LTC K.M. Woodbury.

by MCR in costing the selected weapon system (M-1). The CMFs of greatest interest are those in which the largest population occurs within the system or those which are critical to the system, such as operators and maintainers. The two most important CMFs are 19 (armor crewmen) and 63 (maintenance) although several others are found in the M-1 battalion. The average years of service by pay grade used in these calculations are given below:^{12/}

<u>E-3</u>	<u>E-4</u>	<u>E-5</u>	<u>E-6</u>	<u>E-7</u>
1.5	3	5	10	16

Table IV-1 lists the continuation rates for the M-1 battalion CMFs. Loss rates, used in cost calculations, are the complement of these rates.

Table IV-1. ARMY FY80 CONTINUATION RATES FOR M-1 BATTALION CAREER MANAGEMENT FIELDS (BY PAY GRADE)

<u>CMF</u>	<u>E-3</u>	<u>E-4</u>	<u>E-5</u>	<u>E-6</u>	<u>E-7</u>
11	.79	.79	.61	.81	.91
12	.72	.72	.87	.90	.92
16	.78	.78	.82	.84	.91
19	.84	.84	.66	.79	.87
31	.78	.78	.77	.85	.92
54	.88	.88	1.00	1.00	1.00
63	.77	.77	.69	.85	.90
64	.77	.77	.85	.85	.91
71	.81	.81	.85	.88	.95
76	.78	.78	.91	.90	1.00
79	N/A	N/A	1.00	1.00	1.00
91	.82	.82	.82	.84	.95
94	.69	.69	.83	.87	.81

As shown in this table two CMFs, 54 and 79 have zero loss rates. This is possible for CMF 54 which indicates no annual losses. This is due to transfer of personnel from other CMFs in response to SRB inducements. CMF 79 (reenlistment NCO/recruiter) receives personnel only from transfers from other CMFs.

^{12/} Taken from DCSPER 411 report of November 1980. An alternate source of potentially more accurate data is the Defense Manpower Data Center (DMDC).

2. Navy - Unit Sustainment Factors

Historically, NAVAIR has not used manpower loss factors in calculating manpower life cycle costs. The MCR factors have been developed from Navy-provided data:

- Unit Sustainment Recruitment Factor - Recruitment costs are calculated using the overall FY80 Navy loss rate for enlisted personnel of 36.6%.
- Unit Sustainment Enlistment Bonus Factors - The enlistment bonus factor is based on the average loss rate for E-3s throughout the Navy. This rate is 31.0%. The only occupation required by the LAMPS Mk III squadron receiving an Enlistment Bonus is the Mess Management Specialist (MS). Specific award data is not readily available for this rating.
- Unit Sustainment Selective Reenlistment Bonus Factors - The SRB factor is calculated based on the average period of reenlistment in the Navy (four years), the current award level and zone, and the average pay grade and years of service in the given zone. For the Navy, the averages for each zone are:
 - Zone A - E-4 over four years,
 - Zone B - E-6 over eight years, and
 - Zone C - E-6 over ten years.^{13/}
- Unit Sustainment Training Factors - The sustainment factors for Navy training costs are based on loss rates by occupation. These loss rates are used as annual rates of personnel replacement for each occupation. Rates were developed by MCR based on FY80 data developed using the FAST model.^{14/} Table IV-2 lists the loss rates for each of the occupations required by the LAMPS Mk III. As can be seen in this table, all of the ratings involved have a loss rate of approximately 30%. The overall Navy enlisted loss rate is 36.6% annually. The LAMPS MK III overall loss rate is 30%. This is consistent with the shortage of mid-level personnel (i.e., petty officers) currently being experienced by the Navy.

13/ Information obtained from OP-136D, LCDR Roger Hope.

14/ Information obtained from OP-135D, LT Paul Johnson.

Table IV-2. NAVY OCCUPATIONAL LOSS RATES
FOR LAMPS Mk III OCCUPATIONS

<u>OCCUPATION CODE</u>	<u>OCCUPATION TITLE</u>	<u>FY8G LOSS RATE</u>
AD	Aviation Machinist's Mate	.30
AE	Aviation Electrician's Mate	.32
AK	Aviation Storekeeper	.33
AME	Aviation Structural Mechanic (Safety Eqp.)	.27
AMH	Aviation Structural Mechanic (Hydraulics)	.29
AMS	Aviation Structural Mechanic (Structures)	.28
AO	Aviation Ordnanceman	.35
AT	Aviation Electronics Technician	.33
AW	Antisubmarine Warfare Operator	.31
AX	Antisubmarine Warfare Technician	.31
AZ	Aviation Maintenance Administrationman	.32
DK	Disbursing Clerk	.34
HM	Hospital Corpsman	.33
MS	Mess Management Specialist	.40
PN	Personnelman	.34
PR	Aircrew Survival Equipmentman	.32
YN	Yeoman	.37

3. Air Force - Unit Sustainment Factors

The Air Force uses a total enlisted turnover factor in the calculation of training and acquisition costs. MCR has developed specific occupation factors from Air Force-provided data:

- Unit Sustainment Recruitment Factor - Recruitment costs using the MCR unit sustainment methodology are calculated using the overall Air Force enlisted loss rate of 13.5% ^{15/} since this is not an occupation-specific cost.
- Unit Sustainment Enlistment Bonus Factors - Enlistment bonuses are not common in the Air Force and are only briefly mentioned here. None of the proposed GLCM AFSCs are currently being awarded enlistment bonuses.
- Unit Sustainment Selective Reenlistment Bonus Factors - The Air Force does not include SRB costs in its sustainment cost estimation process. MCR's methodology includes this cost category. Average amounts for SRBs were computed by deflating FY81 SRB budgeted amounts by 11.7% ^{16/} to arrive at FY80 amounts contained in the table. The budgeted amounts were based on average grade/years of service for each SRB zone as indicated below:
 - Zone A - E-4 over three years,
 - Zone B - E-5 over six years, and
 - Zone C - E-6 over ten years.
- Unit Sustainment Training Factors - Occupation-specific attrition factors for proposed GLCM occupations are presented in Table IV-3. The rates listed were calculated based on projected losses and projected authorizations for FY81 using data provided by the Airman Information Retrieval System (AIRS). The computations involved dividing projected losses by projected authorizations to arrive at a projected loss rate.

^{15/} Loss rate contained in Air Force Pamphlet (AFP) 173-13 and used with the Cost Oriented Resources Estimating (CORE) Model.

^{16/} 11.7% was used since that is the FY81 military pay increase.

Table IV-3. AIR FORCE OCCUPATIONAL LOSS RATES
FOR PROPOSED GLCM OCCUPATIONS

<u>OCCUPATION CODE</u>	<u>OCCUPATION TITLE</u>	<u>FY80 LOSS RATE</u>
304X0	Radio Relay Equipment Repairman	.200
316X0C*	Missile Systems Analyst	.200
328X0	Avionics Communications Specialist	.200
391X0	Maintenance Analysis Specialist	.132
392X0	Maintenance Management Specialist	.111
423X5	Aerospace Ground Equipment Mechanic	.171
427X4	Metals Processing Specialist	.153
443X0C**	Missile Mechanic	.224
461X0	Munitions Systems Specialist	.174
463X0	Nuclear Weapons Specialist	.190
472X4	Vehicle Maintenance Analysis Specialist	.062
545X0	Refrigeration/Air Conditioning Specialist	.166
645X0	Inventory Management Specialist	.157
702X0	Administrative Management Specialist	.189
811X0	Security Specialist	.259

* Loss rate for this new shredout is computed from the 316X0 data.

** Loss rate for this new shredout is computed from the 443X0 data.

In estimating training costs the Air Force applies an average attrition factor for each year of the life cycle cost estimate. The overall enlisted loss rate currently used by the Air Force is 13.5%. This value is a computed average rate for all enlisted personnel, spanning all grades and career fields. MCR used occupation-specific loss rates for Air Force training costs.

As can be seen in Table IV-3, 12 of the 15 AFSCs have an attrition rate higher than the average rate of 13.5% used in Air Force sustainment cost estimation. The average for these 15 AFSCs is 17.3%. This shows that a Service-wide average does not necessarily reflect system-specific attrition rates. Occupation-specific attrition rates should be used where possible to properly reflect the impact on specific systems.

C. M-1 MANPOWER COSTS

The M-1 has been costed using two procedures: the unit sustainment cost methodology (developed by MCR), and the standard Army methodology (described in DA PAM 11-4). The latter has been calculated using the factors developed for the IPCE. Both of these are described in Section III. The MCR costs were developed for the enlisted personnel in a single tank battalion (no officers were costed). The estimate of 511 enlisted is the current required strength for an M-1 tank battalion. M-1-specific MOS and pay grade adjustments to the basic TOE were based on guidance received from the Force Integration Staff Officer (FISO). The detailed matrix of pay grade and MOS combinations, shown in Table II-4, is the basis for the analysis using the unit sustainment methodology.

The calculations using the Army methodology follow the standard procedure of allocating military personnel per weapon system within the force unit. The Army does not cost the entire battalion but rather only those personnel directly identified with a given system. In an effort to make reasonable and

valid comparisons between the two methodologies, the final cost comparisons are made on the basis of an estimated manpower cost per tank rather than unit manpower costs. For the purposes of this research the factors and costs used in the March 1979 M-1 IPCE for DSARC Milestone III have been used. The costs have been updated to FY80 dollars and have incorporated the factors in the October 1979 version of the Army Force Planning Cost Handbook (AFPCH).

1. M-1 Manpower Costs Using the MCR-Developed Unit Sustainment Manpower Cost Methodology

These costs have been developed using the total required strength of an M-1 battalion of 511 enlisted personnel. The occupation- and pay grade-specific data and calculations are provided on two tables: "Annual M-1 Unit Sustainment Manpower Costs by Pay Grade," Table IV-4; and "Annual M-1 Unit Sustainment Costs by Occupation," Table IV-5.

a. Manpower Costs by Pay Grade

Table IV-4 arrays pay grade-specific costs. All costs are in FY80 dollars. For the M-1 tank battalion, the enlisted personnel include only pay grades E-3 through E-9. The cost categories listed on this table are explained below:

- Pay and Allowances:
 - Adjusted Standard Rate (ASR) - The Composite Standard Rate (CSR) adjusted to exclude certain costs such as quarters. This is taken from the "Average Cost Handbook" and is pay grade-specific. The CSR includes basic pay, quarters, miscellaneous expenses (rations, FICA, clothing, bonuses, and several small costs), and incentive/special pay. The ASR excludes quarters and incentive/special pay.
 - Enlistment and Selective Reenlistment Bonuses - These bonuses were included in the ASR as an average cost of equal value for all grades. They are deducted from the ASR to be used in precise occupation-specific cost calculations in Table IV-5.

Table IV-4. ANNUAL M-1 UNIT SUSTAINMENT MANPOWER COSTS BY PAY GRADE (FY80 \$)

PAY GRADE	PAY AND ALLOWANCES (\$)			RETIREE MENT (\$)	SUPPORT (\$)	RECRUITMENT (\$)	PCS (\$)	TOTAL (\$)	QUANTITY BY PAY GRADE	TOTAL ANNUAL COST BY PAY GRADE (\$)
	ADJUSTED STANDARD & REENLIST- MENT BONUS- RATE (+)	ENLISTMENT & REENLIST- MENT BONUS- RATE (-)*	QUARTERS (+)							
E-9	21,186	(197)	3,435	24,424	6,764	1,619	391	792	33,990	1
E-8	17,924	(197)	3,169	20,896	5,613	1,622	391	792	29,314	7
E-7	15,202	(197)	2,923	17,928	4,725	1,588	391	792	25,424	24
E-6	12,693	(197)	2,665	15,151	3,876	1,568	391	792	21,778	57
E-5	10,602	(197)	2,314	12,719	3,143	1,461	391	792	18,576	119
E-4	9,241	(197)	1,844	10,888	2,667	1,247	391	792	15,985	157
E-3	8,549	(356)	1,496	9,648	2,387	1,042	391	792	14,755	136
TOTAL**				6,151,197	1,535,935	667,491	199,331	454,712	511	\$9,952,029

*MCR deducted this average cost per pay grade for the purposes of this analysis. This occupation-specific cost is incorporated in the adjusted standard rate (ASR) and has been deducted here.

**Column totals are derived by multiplying each pay grade-specific cost by the corresponding quantity by pay grade and summing the products.

- Quarters - The quarters costs by pay grade in the "Average Cost Handbook" are in error. The Handbook methodology requires the use of BAQ rates for Service members as a surrogate for operation and maintenance of government-provided quarters. The Army used the FY80 cost of BAQ payment, thereby excluding the cost of government-provided quarters in the Handbook data. As a substitute, the average of Quarters costs for the Navy and Air Force in the handbook are cited here.
- Subtotal - This is a subtotal of three costs: adjusted standard rate minus average bonuses plus quarters.
- Retirement - This is taken from the "Average Cost Handbook" and is pay grade-specific.
- Support - This is taken from the "Average Cost Handbook" and is pay grade-specific.
- Recruitment - This is calculated by dividing the total budgeted cost for FY80 of Recruiting and Advertising by the total number of non-prior Service (NPS) accessions. The cost of \$1,581 was multiplied by the unit sustainment recruitment factor (FY80 enlisted loss rate) of 0.247 to arrive at the annual cost per person of \$391.
- Permanent Change of Station (PCS) - The "Average annual PCS cost per man" for the Army cited in the March 1979 M-1 IPCE is used here. The \$501 FY72 cost is inflated to FY80 dollars by multiplying by 1.58, which yields an annual per capita cost of \$792.
- Total - This is the total of all costs by pay grade.
- Quantity - This is the projected quantity of enlisted personnel by pay grade for the M-1 tank battalion.
- Total Annual Cost by Pay Grade - This cost is calculated by multiplying the total cost for each pay grade by the quantity. These are the total pay grade-specific costs for the M-1 tank battalion. The total annual pay grade-specific costs for an M-1 tank battalion is \$8,959,029.

b. Manpower Costs by Occupation

Table IV-5 arrays occupation-specific costs.

All costs are in FY80 dollars. The costs associated with the 32 MOSs required in an M-1 tank battalion are examined on this table. The cost categories listed on this table are explained below:

Table IV-5. ANNUAL M-1 UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION (FY80 \$)

Occupation Title	Occupation Code*	Pay Grade	Training Costs (\$)*	Loss Rate	Annual Training Cost (\$)	Annual Enlistment Bonus (\$)	Annual SRB (\$)	Individual Annual Costs (\$)	Quantity in Occupation	Total Annual Costs by Occupation (\$)
Command Sgt. Major	002 (50)	E-9	---	---	---	---	---	---	1	---
Radio Operator	058 (10)	E-4	7,520	.22	1,654	600	---	1,654	2	3,308
	(10)	E-3	7,520	.22	1,654	600	---	2,254	1	2,254
Radio Teletype Operator	05C (20)	E-5	15,719	.18	2,829	---	---	2,829	2	5,658
	(10)	E-4	13,959	.22	3,071	---	3,071	3,071	2	6,142
	(10)	E-3	13,959	.22	3,071	1,000	---	4,071	2	8,142
Indirect Fire Infantryman	11C (40)	E-7	15,125	.09	1,361	---	---	1,361	1	1,361
	(30)	E-6	10,331	.19	1,963	---	---	1,963	1	1,963
	(20)	E-5	7,767	.39	3,029	---	752	3,781	6	22,686
	(10)	E-4	5,353	.21	1,124	---	618	1,742	9	15,678
	(10)	E-3	5,353	.21	1,124	1,600	---	2,724	9	24,516
Engineer Tracked Vehicle Crewman	12F (30)	E-6	13,000***	.10	1,300	---	---	1,300	1	1,300
	(20)	E-5	11,478	.13	1,492	---	752	2,244	1	2,244
	(10)	E-4	7,956	.28	2,228	---	618	2,846	2	5,692
Redeye/Stinger Man-	16S (30)	E-6	11,082	.16	1,773	---	---	1,773	1	1,773
pc. Table Air Defense System Operator	(@ 16R)									
	(20)	E-5	8,815	.18	1,587	---	---	1,587	5	7,935
	(10)	E-4	6,698	.22	1,474	---	---	1,474	5	7,370
Cavalry Scout	19D (40)	E-7	16,223	.13	2,109	---	---	2,109	1	2,109
	(30)	E-6	14,260	.21	2,995	---	---	2,995	4	11,980
	(20)	E-5	10,589	.34	3,670	---	752	4,352	6	26,112
	(10)	E-4	7,067	.16	1,132	---	618	1,749	13	22,737
	(10)	E-3	7,067	.16	1,132	1,600	---	2,731	7	19,117
M-1 Armored Crewman	19K (40)	E-7	19,509	.13	2,549	---	---	2,549	11	28,039
	(@ 19J)									
	(30)	E-6	14,816	.21	3,111	---	---	3,111	36	111,996
	(20)	E-5	11,144	.34	3,741	---	752	4,541	35	158,935
	(10)	E-4	7,471	.1*	1,121	---	618	1,819	37	68,006
	(10)	E-3	7,471	.1*	1,121	1,600	---	2,819	52	149,460

*Specific training costs are developed by skill digit, which relates to pay grade.

** denotes instances where training costs for another similar MOS have been used because training costs for the given MOS are not available in the data source, the MOSB.

***No training cost for MOS 12F30 appears in the MOSB. This figure represents an estimated cost based on 12F20 training cost.

Table IV-5. ANNUAL M-1 UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION (FY80 \$) (Cont'd)

Occupation Title	Occupation Code*	Pay Grade	Training Costs (\$)**	Loss Rate	Annual Training Cost (\$)	Annual Enlistment Bonus (\$)	Annual SRB (\$)	Individual Annual Costs (\$)	Quantity in Occupation	Total Annual Costs by Occupation (\$)
M-1 Tank Driver	19L (20)	E-5	11,144 (@ 19J) 7,622	.34 .16 .16	3,789 1,220 1,220	--- 1,600	752 618 ---	4,541 1,838 2,820	19 19 16	86,279 34,922 45,120
Armor Senior Sgt.	19Z (40)	E-4	---	---	---	---	---	---	7	---
TAC Comm. Syst. Oper./Mechanic	31V (40)	E-8	---	---	---	---	---	---	7	---
TAC Wire Ops. Specialist	36K (10)	E-7	11,169	.08	894	---	894	1,299	1	894
Metal Worker	44B (20)	E-6	8,658	.15	1,299	---	618	1,75	4	5,196
M-1 Tank Turret Mechanic	45E (20)	E-4	5,257 (10)	.22	1,157	---	618	1,75	4	7,100
Chemical Ops. Specialist	54E (30)	E-3	3,493	.22	768	---	752	1,157	1	1,157
Power Gear/Wheel Vehicle Mechanic	63B (20)	E-5	10,691	.23	2,459	---	768	768	3	2,304
Heavy Wheeled Vehicle Mechanic	63J (20)	E-4	10,691	.23	2,459	---	752	612	3	1,536
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*SFC's training costs are developed by skill digit, which relates to pay grade.

**Other jobs instances where training costs for another similar MOS have been used because training costs for the given MOS are not available in the data source, the MSGS.

Table IV-5. ANNUAL M-1 UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION (FY80 \$) (Cont'd)

Occupation Title	Occupation Code*	Pay Grade	Training Costs (\$)**	Loss Rate	Annual Training Cost (\$)	Annual Enlistment Bonus (\$)	Annual SRB (\$)	Individual Annual Costs (\$)	Quantity in Occupation	Total Annual Costs by Occupation (\$)
1FV/CFV/ITV Mechanic	63T (40) (20) (10)	E-7	15,170	.10	1,517	---	---	1,517	1	1,517
		E-5	12,129	.31	3,760	---	752	4,512	2	9,024
		E-4	10,369	.23	2,385	---	618	3,003	3	9,009
Motor Transport Operator	64C (40) (20) (10)	E-7	7,229	.09	651	---	---	651	1	7,155
		E-5	6,126	.15	919	---	---	919	1	651
		E-4	4,096	.23	942	---	---	942	9	8,478
Legal Clerk	71D (20)	E-5	6,688	.15	1,003	---	---	942	9	8,478
Admin. Specialist	71L (10)	E-4	5,224	.19	993	---	---	1,003	1	1,003
Personnel Admin. Specialist	75B (20) (10)	E-5	9,894	.15	1,484	---	---	993	2	1,986
Personnel Senior Sgt.	75J (40) (30)	E-4	8,134	.19	1,545	---	---	1,484	1	1,484
		E-3	8,134	.19	1,545	---	---	1,545	1	1,545
		E-7	8,963	.05	449	---	---	1,545	2	3,090
Eng'r. Supply & Parts Specialist	76C (20) (10)	E-6	8,734	.12	1,048	---	---	449	1	449
Petroleum Supply Specialist	76W (20) (10)	E-5	4,921	.15	738	---	---	1,048	1	1,048
		E-4	3,161	.19	601	---	---	738	5	3,690
		(@ 76A(10))				---	601	5	5	3,005
Recruitment NCO	76Y (40)	E-5	7,661	.09	689	---	689	1	689	1
Unit Supply Specialist	76Y (30) (20)	E-4	5,901	.22	1,298	---	1,298	3	3,894	---
Medical Specialist	91B (40) (30) (20)	E-7	8,124	.00	---	---	---	1	---	1
		E-6	8,040	.10	804	---	804	5	4,020	5
		E-5	6,432	.09	579	---	579	5	2,895	5
Medical Specialist	91B (40) (30) (20)	E-4	3,161	.22	695	---	695	2	1,590	2
		E-3	3,161	.22	695	---	695	3	2,085	3
		E-6	8,497	.00	---	---	---	1	---	1
Medical Specialist	91B (40) (30) (20)	E-7	13,042	.05	652	---	652	1	652	1
		E-6	9,832	.16	1,574	---	1,574	1	1,574	1
		E-5	7,346	.18	1,322	---	1,322	7	9,254	7
Medical Specialist	91B (40) (30) (20)	E-4	5,566	.18	1,005	---	618	1,673	8	12,894
		E-3	5,586	.18	1,005	---	1,005	4	4,020	4

*Sustaining training costs are developed by skill digit, which relates to pay grade.

**At unit's instarlist, where training costs for another similar MOS have been used because training costs for the given MOS are not available in the data source, the MOS8.

Table IV-5. ANNUAL M-1 UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION (FY80 \$) (Cont'd)

* Specific training costs are developed by skill digit, which relates to pay grade.
@ denotes instances where training costs for another similar MOS have been used b.

The data source, the MJSB, Column totals are derived b.

the products.

- Occupation Title - Most MOS titles for the M-1 tank battalion were obtained from the MOS Handbook (MOSB). Titles of new MOSSs, especially those which are system specific to the M-1 tank, were obtained from the M-1 FISO.
- Occupation Code - Occupations are specified by MOS code. The MOS code consists of five characters. The first three characters (two numbers followed by a letter) identify the basic skill. The last two characters further specify relative skill levels and special qualifications required for a given position.
- Pay Grade - This is taken from the list prepared by the FISO in the M-1 BOIP Analysis or from TOE 17-035 H010, and corresponds to the skill digit.
- Training Costs - The total weighted variable cost for the MOS corresponding to skill digit or pay grade is taken from the MOSB for the exact MOS (identified by the full five-character MOS code). In the case of new MOSSs specific to the M-1, the total weighted variable cost for a comparable MOS has been used. All training costs are taken from the September 1980 update of the MOSB Volume I, (enlisted) and are in FY80 dollars. No training cost is applied to E-8 and E-9 positions.
- Loss Rate - This is the unit sustainment training factor. These factors are derived from Army FY80 continuation rates for career management fields by pay grade. Table IV-1 lists all the rates used as unit sustainment training factors in this calculation.
- Annual Training Cost - The training cost times the loss rate provides the annual cost for each MOS listed.
- Annual Enlistment Bonus - The enlistment bonus for those MOSSs authorized them has been multiplied by the unit sustainment enlistment bonus factor of 0.40 to derive an annual enlistment bonus cost. For example, MOS 19D is eligible for a \$4,000 enlistment bonus. The 0.40 factor adjusts for the actual number of personnel who receive the bonus. This calculation is only applied to E-3s.
- Annual SRB - The selective reenlistment bonus (SRB) costs for eligible MOSSs (shown previously on Table II-2) have been annualized using a Unit Sustainment SRB factor of 0.20 based on the average Army reenlistment period of five years. Zone A bonuses have been applied to E-4 positions and Zone B bonuses to E-5 positions. The unit sustainment SRB factor has been used to develop an annual SRB cost.

- Individual Annual Costs - This is the total of the annual costs of training, enlistment bonuses, and SRBs. E-8 and E-9 personnel were not costed.
- Quantity in Occupation - MOS quantity for the M-1 tank battalion is determined from the FISO's BOIP Analysis as of September 1980 combined with the current TOE. This is used as the multiplier of the Individual Annual Costs for each MOS.
- Total Annual Cost by Occupation - These are the total occupation-specific costs for the M-1 battalion and is the product of the individual annual cost for each MOS times the quantity of personnel in each MOS. The total M-1 battalion occupation-specific cost is \$1,227,163.

2. M-1 Manpower Costs Using the Army Methodology

The Army methodology used for the Independent Parametric Cost Estimate (IPCE) and explained in DA PAM 11-4 has been used in these calculations. The personnel allocation and cost factors for military personnel have been taken from the March 1979 M-1 IPCE. The Army used FY72 base year costs adjusted to FY79 dollars. MCR has adjusted the FY72 dollars to FY80 dollars. The MCR adjustment factor of 1.7205 was derived by multiplying the Army factor of 1.6079 used in the IPCE (used to convert FY72 dollars to FY79 dollars) by 1.07 to compensate for to FY80 pay raise.

The calculation for each Army cost element shown on Table IV-6 is explained below. These are annual costs per M-1 tank:

- Crew Pay and Allowances - 4 persons per tank crew times annual pay and allowances of \$6,719 (FY72 \$) adjusted to FY80 \$ (1.7205 adjustment factor) is \$46,240.
- Maintenance Pay and Allowances - 1.5 persons per tank times annual pay and allowances of \$5,738 (FY72 \$) adjusted to FY80 \$ (1.7205 adjustment factor) is \$14,808.
- Indirect Pay and Allowances - 2.63 indirect personnel per tank times annual pay and allowances of \$7,392 (FY72 \$) adjusted to FY80 \$ (1.7205 adjusted factor) is \$33,448.

Table IV-6. ANNUAL M-1 OPERATING AND SUPPORT COSTS - ARMY METHODOLOGY (FY80 \$)

COST ELEMENT	COST FACTOR (\$)	MANPOWER FACTOR	COST (\$)
MILITARY PERSONNEL COSTS:			
● Pay and Allowances:	--	--	(100,935)
- Crew	--	--	(94,496)
- Maintenance	11,560	4	46,240
- Indirect	9,872	1.5	14,808
● Permanent Change of Station	12,718	2.63	33,448
INDIRECT SUPPORT OPERATIONS:			
● Personnel Replacement	--	--	(33,854)
● Quarters, Maintenance, and Utilities	2,305	8.13	18,740
● Medical Support	675	8.13	5,488
● Other Indirect (Base Operations)	337	8.13	2,740
TOTAL	--	8.13	6,886
		--	134,789

- Permanent Change of Station (PCS) - The IPCE annual PCS cost per person inflated to FY80 dollars is \$792. This is multiplied by the number of personnel allocated per tank of 8.13 (crew 4, maintenance 1.5 and indirect 2.63) producing a cost of \$6,439.
- Personnel Replacement - The IPCE annual personnel replacement cost of \$1,340 (FY72 \$) times an adjustment factor of 1.7205 andd times 8.13 persons per tank is \$18,740. This includes the cost of recruitment, accession, separation and training.
- Quarters, Maintenance, and Utilities (QMU) - The AFPCH FY80 annual average cost of \$581 for CONUS and \$768 for Europe is averaged to \$675. Multiplied by 8.13 personnel per tank the cost is \$5,488.
- Medical Support - The AFPCH FY80 annual average cost of \$317 for CONUS and \$356 for Europe is averaged to \$337. Multiplied by 8.13 personnel per tank the cost is \$2,740.
- Other Indirect (Base Operations Cost) - The cost of base operations is included in the "Other Indirect" cost element of the Army cost breakdown structure. It is calculated and listed here in order to approximate the costs covered by the "Support" costs listed in the "Average Cost Handbook." Base Operations per capita costs are available from AFPCH (p. I-11) for CONUS and Europe as follows:

CONUS:	\$1,311
Europe:	\$1,733
Average:	\$1,522 per capita annual Base Operations Cost

Quarters, maintenance, and utilities are also included in this cost (44.3% of total). In order to avoid counting QMU twice, it is deducted from base operations to yield an annual average cost of \$847. Multiplied by 8.13 personnel per tank the cost is \$6,886.

- Total - The total cost for one M-1 tank using approximately the same manpower cost categories as the unit sustainment manpower cost methodology is \$134,789. The Army does not include enlistment or reenlistment bonus costs in their cost methodology.

3. Comparison of Manpower Costs

It is necessary to compare the manpower costs on an equitable basis since the MCR unit sustainment costing was for

an entire tank battalion and the Army manpower costing is based on allocation of personnel per tank. The manpower requirement of 511 personnel used by MCR equates to 9.46 personnel per tank. The Army allocation factor is 8.13 personnel per tank. Using the proportion of $\frac{8.13}{9.46}$ or .8594, multiplied by the MCR unit sustainment costs and then dividing the result by 54 (the number of tanks in a battalion) gives a cost per tank of \$162,111.

Each comparable MCR and Army manpower cost element has been aligned on Table IV-7. The primary cost difference between the two methods is the addition of retirement and bonuses to the MCR costs. These costs are not included in the Army costs. The Army costs are shown on Table IV-6. The MCR costs are shown on Tables IV-4 and IV-5. The MCR unit costs had to be factored so they would be comparable to Army costs per tank. The MCR factoring calculation consisted of multiplying the cost for each element by 0.8594 and then dividing by the number of tanks in the battalion (54).

- Pay and Allowances - Both methodologies developed pay grade-specific costs based on the grade structure within a tank battalion. The slight difference in cost is principally due to the treatment of quarters costs. MCR used a quarters cost for all quarters maintenance and utilities in pay and allowances, whereas the Army identifies this as a support cost.

$$\text{Sample calculation: } \frac{(\$6,151,190 \times .8594)}{54} = \$97,895$$

- Support - The medical and base operation costs equate to the MCR support cost. When pay and allowances and support costs are added, the MCR and Army methodologies are quite close (within 1%).
- Recruitment and Training - Both the Army and MCR use occupation-specific training costs. The Army includes recruitment as part of the personnel replacement cost. Both methodologies provide similar costs (within 3%).
- Permanent Change of Station (PCS) - This cost is the same for both methodologies since the Army cost factor was used in both calculations.

Table IV-7. COMPARISON OF ANNUAL M-1 MANPOWER COSTS (FY80 \$)

Manpower Costs for One M-1 Tank

MCR METHODOLOGY		ARMY METHODOLOGY		REMARKS
COST ELEMENT	COST (\$)	COST ELEMENT	COST (\$)	
Pay & Allowances	97,835	Pay & Allowances	94,496	Military Pay & Allowances are pay grade-specific.
Support	10,623	QMU	5,433	MCR has considered quarters maintenance as part of quarters.
---	---	Medical	2,740	Medical and Base Operations have been considered comparable to Support.
---	---	Base Operations	6,886	
Subtotal:	116,623	Subtotal:	15,114	
Equipment:	3,154	Personnel Replacement	18,740	Army calculated occupation-specific training costs. MCR also had calculated training based on occupation-specific data.
Training	15,071	---	---	
Support	13,753	Subtotal:	18,740	
Pay	6,441	PCS	6,434	
Total	133,249	Total:	134,781	
Allowances	25,517			
Pay Grade*	5,517			
Pay Rate	16,000			

*Occupational allowances are calculated separately from pay rates in the MCR calculations.
Pay grade allowances are calculated separately from pay rates in the MCR calculations.

- Total - The MCR and Army methodologies both provide approximately the same cost per tank since both methods use pay grade-specific and occupation-specific costs (within 1%). However, the addition of bonus costs and retirement cost in the MCR methodology adds 22%.

4. Observations

The Army is fairly precise in the derivation of pay grade- and occupation-specific costs for pay and allowances and personnel replacement (training costs). The same precise approach by MCR yielded very similar results: \$133,209 per tank versus \$134,789 per tank using the Army methodology. The addition of bonus cost, which seems reasonable since that is included in other Services' pay and allowance costs, still does not make a significant difference (4%). Only retirement cost causes a large difference in costs (18%). However, until DoD makes a decision to include retirement costs, it appears that Army weapon system manpower costing is quite precise in terms of including occupation- and pay grade-specific costs.

D. LAMPS MK III MANPOWER COSTS

The LAMPS Mk III has been costed using two procedures: the MCR unit sustainment cost methodology and the Navy Resource Model (NARM) factors. Only the enlisted unit manpower in an operational squadron has been costed for the LAMPS Mk III. No officers have been costed. The operational squadron contains two components: the 13 sea detachments and the shorebased component. A standard LAMPS Mk III operational squadron is projected to require 232 enlisted personnel. A detailed breakdown of LAMPS Mk III enlisted personnel is shown on Table II-11.

A second type of squadron is also required for the LAMPS Mk III, a Fleet Readiness Squadron (FRS). The FRS is a totally

dedicated training squadron. Although it is currently planned to have the same number of aircraft as an operational squadron (13) it has a slightly larger quantity of enlisted personnel (248). A detailed breakdown of FRS personnel is also shown on Table II-11. The FRS is usually not included as a separate unit in Navy calculations of manpower costs since the standard approach is to calculate manpower costs by aircraft. The FRS manpower costs have been calculated separately and are discussed in the cost part of this subsection. The FRS manpower costs have been examined in terms of the cost differences with the operational squadron. The manpower data for both of these squadrons has been obtained from the Draft LAMPS Mk III Navy Training Plan of August 1980.

1. LAMPS Mk III Manpower Costs Using the MCR-Developed Unit Sustainment Manpower Cost Methodology

These costs have been developed using the estimate of 232 enlisted personnel required for a LAMPS Mk III operational squadron. The occupation- and pay grade-specific data and calculations are provided on two tables: Table IV-8, "Annual LAMPS Mk III Unit Sustainment Manpower Costs by Pay Grade," and Table IV-9, "Annual LAMPS Mk III Unit Sustainment Manpower Cost by Occupation."

a. Manpower Costs by Pay Grade

Table IV-8 arrays the pay grade-specific costs. All costs are in FY80 dollars. The LAMPS Mk III operational squadron requires personnel in pay grades E-3 through E-9. The cost categories on this table are discussed below:

• Pay and Allowances:

- Adjusted Standard Rate (ASR) - The Composite Standard Rate adjusted to exclude certain costs such as quarters. This is taken from the "Average Cost Handbook," and is pay grade-specific.

Table IV-8. ANNUAL LAMPS Mk III UNIT SUSTAINMENT MANPOWER COSTS BY PAY GRADE (FY80 \$)
 LAMPS Mk III Operational Squadron

PAY GRADE	PAY AND ALLOWANCES (\$)			RETIREE MENT (\$)	SUPPORT (\$)	RECRUITMENT (\$)	PCS (\$)	TOTAL (\$)	QUANTITY BY PAY GRADE	TOTAL ANNUAL COST BY PAY GRADE (\$)	
	ADJUSTED STANDARD RATE (+)	ENLISTMENT & REENLIST- MENT BONUS- RATE (-)*	QUARTERS (+)								
E-9	21,282	(357)	3,423	24,348	6,539	2,865	544	451	34,747	2	69,494
E-8	18,01	(357)	3,155	20,815	5,480	2,850	544	451	30,140	4	120,560
E-7	15,431	(357)	2,899	17,973	4,672	2,743	544	451	26,383	14	369,362
E-6	12,939	(357)	2,607	15,189	3,861	2,459	544	451	22,504	31	637,624
E-5	10,587	(357)	2,217	12,147	3,080	1,886	544	451	18,438	70	1,268,560
E-4	9,311	(357)	1,766	10,720	2,654	1,638	544	451	16,597	76	1,216,532
E-3	8,491	(357)	1,474	9,608	2,389	1,480	544	451	14,472	35	506,473
TOTAL										231	\$4,261,647

*An average enlistment and reenlistment bonus cost is incorporated in the Adjusted Standard Rate (ASR). This occupation-specific cost is deducted from the ASR and used in the occupation-specific cost calculations.

Table IV-9. ANNUAL LAMPS Mk III UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION*
Lamps Mk III Operational Squadron

Occupation Title	Occupation Code	Training Costs (\$)**	Loss Rate	Annual Training Costs (\$)	Quantity in Occupation	Total Annual Training Costs (\$)	Annual Bonus & SRB (\$)****	Total Annual Costs by Occupation (\$)
Aviation Machinist's Mate	AD	3,476	.30	1,043	31	32,333	---	32,333
Aviation Electrician's Mate	AE	4,779	.32	1,529	30	45,870	---	45,870
Aviation Storekeeper	AK	4,425	.33	1,460	8	11,680	---	11,680
Aviation Structural Mechanic (Safety Equipment)	AME	5,503	.27	1,486	1	1,486	---	1,486
Aviation Structural Mechanic (Hydraulics)	ANH	4,599	.29	1,334	15	20,010	---	20,010
Aviation Structural Mechanic (Structures)	AMS	5,190	.28	1,453	17	24,701	---	24,701
Aviation Ordnanceman	AO	5,129	.35	1,795	3	5,385	---	5,385
Aviation Electronics Technician	AT	12,106	.33	3,995	16	63,920	11,718	75,638
Aviation Anti-Submarine Warfare Operator	AW	7,563	.31	2,345	29	68,005	46,077	114,082
Aviation Anti-Submarine Warfare Technician	AX	12,633	.31	3,916	16	62,656	---	62,656
Aviation Maint. Administration-man	AZ	3,601	.32	1,152	8	9,216	---	9,216
Disbursing Clerk	DK	4,529	.34	1,540	1	1,540	---	1,540
Hospital Corpsman	HM	5,343	.33	1,763	1	1,763	---	1,763
Mess Management Specialist	MS	4,110	.40	1,644	4	6,576	2,328	8,904
Personnelman	PA	4,149	.34	1,411	5	7,055	651	7,706
Aircraft Survival Equipmentman	PP	5,512	.32	1,764	2	3,528	---	3,528
Yeoman	YN	4,575	.37	1,693	8	13,544	---	13,544
Airmar Seaman	AS/SA*****	3,294	.31	1,021	22	22,457	---	22,457
Aviation Petty Off.	APG	---	---	7	2	462	462	462
Petty Off.	PO	---	---	2	226	462,503	60,774	523
TOTAL:						462,503	60,774	523

*These calculations do not include E-9 and E-9 personnel.

**Training costs obtained from FY81 Training Resource Model data.

***Details of those calculations are in Appendix R.

****Airmar/Seaman are non-rated positions. The loss rate for E-1 through E-3 has been used in these calculations.

- Enlistment and Reenlistment Bonuses - These bonuses were put in the ASR as the same amount for each pay grade. They are deducted from the ASR to be used in precise occupation-specific cost calculations in Table IV-9.
- Quarters - This is taken from the "Average Cost Handbook," and is pay grade-specific.
- Subtotal - This is the subtotal of three costs: ASR minus average bonuses plus quarters.
- Retirement - This is taken from the "Average Cost Handbook" and is pay grade-specific.
- Support - This is taken from the "Average Cost Handbook" and is pay grade-specific.
- Recruitment - An amount of \$1,486 is the calculated Navy recruitment cost which is derived by dividing total budgeted cost for FY80 Recruiting and Advertising by the total number of Non-Prior Service (NPS) accessions. A unit sustainment recruitment factor of 0.366, the overall Navy loss rate, is applied to the recruitment amount of \$1,486 and yields an annual recruitment cost of \$544 per person.
- Permanent Change of Station (PCS) - The PCS cost contained in the NARM was used. This is the same cost used in the Navy methodology.
- Total - This is the total of all costs by pay grade.
- Quantity by Pay Grade - This is the quantity by pay grade for one LAMPS Mk III operational squadron.
- Total Annual Cost by Pay Grade - These are the total pay grade-specific costs for a LAMPS Mk III operational squadron. This cost is calculated by multiplying the total individual cost for each pay grade by the quantity in that pay grade. The total annual pay grade-specific costs for a LAMPS Mk III operational squadron is \$4,268,652.

b. Manpower Costs by Occupation

Table IV-9 arrays occupation-specific costs. All costs are in FY80 dollars. The LAMPS Mk III operational squadron requires 17 different ratings, which have occupation-specific costs associated with them. In addition there are three other non-rated positions which have personnel assigned (AN/SN, APO and

PO). Of these, only the AN/SN apprentice positions have specific costs identified for training. The training costs given for each rating represent the costs of recruit training and "A" school or initial skill training. Some individuals will receive additional training; however, these costs are currently not available. In order to account for these costs, a surrogate has been used, the training costs for recruit and "A" school training. The cost categories on this table are provided below:

- Occupation Title - These are the standard titles and codes for Navy ratings (occupations).
- Occupation Code - This is an alphabetic code usually representing the key words in the rating title. It is generally composed of three or four letters, with the last character representing the rate of the individual. The rate is comparable to the pay grade.
- Training Costs - These are the occupation-specific costs obtained from the Training Resource Model (TRM), furnished by OP-122.
- Loss Rate - This is the unit sustainment training factor based on the personnel loss rate in each rating. Table IV-2 lists the unit sustainment training factors used in these calculations.
- Annual Training Costs - This is the product of multiplying the rating training cost by the annual rating loss rate.
- Quantity in Occupation - This is the number of people in the operational squadron who are projected to receive occupation-specific training. E-8 and E-9 personnel have not been included in these calculations.
- Total Annual Training Costs - The product of multiplying the annual training costs by the quantity in the occupation.
- Annual Bonus and SRB - This is the sum of separate calculations of the annual bonus costs and the annual SRB costs. These costs have been calculated by multiplying the estimated bonus and SRB amounts (discussed in Section II) by the unit sustainment factors and the number of personnel receiving the payment. Details of these calculations are in Appendix B.

- Total Annual Costs by Occupation - This is the sum of the total annual training costs and the total annual bonus and SRB costs. The total occupation-specific unit manpower cost for the LAMPS Mk III is \$462,504, based on calculations for 226 of the 232 enlisted personnel.

2. LAMPS Mk III Manpower Costs Using the Navy Methodology

The LAMPS Mk III operational squadron was costed using the Navy methodology used for the BCE, using the Navy Resource Model (NARM) factors. The NARM factors are contained in the "Navy Program Factors Manual." The factors are: total manpower cost and total manpower per LAMPS Mk III aircraft. MCR has converted this to a per capita cost and then multiplied by the number of personnel in the operational squadron. The cost calculations appear in Table IV-10.

The following explanation addresses the definition and calculation of the cost elements shown on Table IV-10. Additional detail on the NARM factors is provided in Section III and Appendix C.

- Unit Mission Personnel Cost - This pay and allowance cost is calculated by multiplying the NARM FY80 pay factor of \$11,341 times 232 enlisted personnel (number of enlisted personnel in one LAMPS Mk III Squadron) producing a total of \$2,631,112. The NARM pay and allowance factor contains all military personnel appropriation costs except PCS.
- Indirect Personnel Support
 - Miscellaneous Operating and Support (O&M) - This is the NARM Base Operating Support O&M cost. It is derived by dividing the NARM factor for the LAMPS Mk III (\$25,000) by the NARM Manpower factor (48.9 enlisted) which yields a per capita enlisted cost of \$512. When multiplied by 232 enlisted the total cost is \$118,784.
 - Medical O&M - This cost is calculated by taking the NARM cost factor for the LAMPS Mk III (\$12,000), and dividing that by the NARM Manpower factor (48.79 enlisted) which yields a per capita cost of \$246. When multiplied by 232 enlisted the total cost is \$57,072.

Table IV-10. LAMPS MK III OPERATIONAL SQUADRON ANNUAL OPERATING AND SUPPORT MANPOWER COSTS - NAVY METHODOLOGY (FY80 \$)

COST ELEMENT	COST FACTOR (\$)	MANPOWER FACTOR	COST (\$)
UNIT MISSION PERSONNEL:	--	--	--
● Pay and Allowances	11,341	232	2,631,112
INDIRECT PERSONNEL SUPPORT:	--	--	--
● Miscellaneous O&M	512	232	118,784
● Medical O&M	246	232	57,072
● Permanent Change of Station	451	232	104,632
PERSONNEL ACQUISITION AND TRAINING:	--	--	--
● Acquisition	(68.44 + 82)	232	34,901
● Training	(2238 + 164)	232	557,352
TOTAL	--	--	3,503,853

- Permanent Change of Station (PCS) - The NARM per capita factor of \$451 was multiplied by 232 enlisted to yield a total cost of \$104,632.
- Personnel Acquisition and Training
 - Acquisition - The NARM cost of recruiting and examining consists of a manpower factor (0.30 per LAMPS Mk III) and an O&M cost factor (\$4,000 per LAMPS Mk III). The total manpower cost was derived by dividing 0.30 by the NARM manpower factor for the LAMPS Mk III (48.79) and multiplying this by 232 enlisted which yields 1.4 personnel. When multiplied by the personnel cost factor of \$11,341 the total is \$15,877. The O&M cost is derived by dividing \$4,000 by 48.79 enlisted which gives a per capita cost of \$82. \$82 x 232 enlisted personnel is \$19,024. Thus, the sum total cost is \$34,901.
 - Individual Training - The NARM cost of training consists of a manpower factor (9.63 trainers per LAMPS Mk III) and an O&M factor of \$8,000 per LAMPS Mk III). The manpower cost is derived by dividing 9.63 by 48.79 (NARM factor for LAMPS Mk III) and multiplying by 232 enlisted which yields 45.79 trainers. When multiplied by \$11,341 the total is \$519,304. The O&M cost is derived by dividing \$8,000 by 48.79 enlisted which gives a per capita cost of \$164. When multiplied by 232 enlisted this yields \$38,048.
- Total Cost - The total cost using the Navy methodology is \$3,503,853 for a LAMPS Mk III operational squadron.

3. Comparison of Manpower Costs

Table IV-11 summarizes the comparison of the costs for each of cost elements of the MCR unit sustainment cost methodology and the Navy NARM methodology. Equivalent cost elements are compared from the two methodologies. Since the Navy does not include retirement costs in their methodology, it is added separately.

The comparative analysis of the two methodologies, as depicted in Table IV-11, follows:

- Adjusted Standard Rate (less bonus plus Quarters) - This is approximately the same element as the pay

Table IV-11. COMPARISON OF ANNUAL LAMPS Mk III MANPOWER COSTS
Manpower Costs for One Operational Squadron

MCR METHODOLOGY	COST (\$)	NAVY METHODOLOGY	COST (\$)
COST ELEMENT	COST ELEMENT	COST ELEMENT	COST ELEMENT
Adjusted Standard Rate (less bonuses)	2,304,862	Unit Mission Personnel	2,607,912
Quarters	481,855	---	---
Subtotal (Op3, \$ Allowances)	2,816,727	Subtotal (Pay & Allowances)	2,607,912
Support	440,069	Miscellaneous O&M	118,784
---	---	Medical O&M	57,072
Subtotal	-440,069	Subtotal	175,856
Recruitment	126,216	Acquisition	34,901
Training	561,736	Individual Training	347,352
Serv. Tax	517,326	Subtotal	592,253
FDO	1,61,630	P&S	104,632
Entertainment Bonuses & SRS	66,774	---	---
TOT.	4,916,140	TOTAL	3,490,653
NET DIFFERENCE	721,574		
TOTAL	2,335,574		

*Estimated by the author based on Navy cost factors, but is in line with MCR methodology. For the purpose of this comparison, the difference between the two methodologies, requirement basis and personnel costs, is negligible.

and allowances cost element (Navy methodology). However, it is computed by pay grade for the LAMPS Mk III organization. Hence, it would be expected to furnish a different, more precise, cost than the NARM average enlisted cost factor.

- Support - This cost equates to the miscellaneous O&M (Base Operating Support) and Medical O&M in the Navy methodology. The difference in cost is difficult to analyze as all the components are not apparent. It appears that the main cause of the difference is the NARM factors which are LAMPS-specific and based on expenditures whereas the MCR cost is based on a Navy average.
- Recruitment and Training (MCR methodology) - This compares with Acquisition and Individual Training (Navy methodology) and produces similar costs.
- Permanent Change of Station (PCS) - This cost is the same for both methodologies as the NARM cost has been used in both calculations.
- Enlistment Bonus and SRB - These costs are based on the bonuses awarded to specific ratings. The Navy methodology incorporates this in the unit mission personnel (pay and allowance) cost element.
- Total - Unit sustainment cost using MCR's methodology yields a cost for one operational squadron that is \$506,287 or 15% higher than that calculated using the Navy methodology. When retirement is included in MCR's methodology, the increase is \$1,227,303 or an additional 21% above the Navy costs.

4. Observations

Sustainment costs based on occupation- and pay grade-specific cost and loss factors yield higher cost estimates than those which omit these specific cost factors. A LAMPS Mk III Fleet Readiness Squadron (FRS) was also costed, in similar fashion to the operational squadron, using both methodologies. The MCR methodology (Tables IV-12 and IV-13) yielded a total cost of \$4,940,169, while the Navy methodology (Table IV-14) showed a cost of \$3,745,844, a difference of \$1,194,325. The manpower cost per aircraft for the operational squadron (15 aircraft) is \$363,935 using the MCR unit sustainment methodology and \$267,743 using the Navy methodology. The manpower

Table IV-12. ANNUAL LAMPS Mk III UNIT SUSTAINMENT MANPOWER COSTS BY PAY GRADE (FY80 \$)
Fleet Readiness Squadron

PAY GRADE	PAY AND ALLOWANCES (\$)			RETIREE (\$)	SUPPORT (\$)	RECRUITMENT (\$)	PCS (\$)	TOTAL (\$)	QUANTITY BY PAY GRADE**	TOTAL ANNUAL COST BY PAY GRADE (\$)	
	ADJUSTED STANDARD RATE (+)	ENLISTMENT & REENLIST- MENT BONUS- ES (-)*	QUARTERS (+)								
E-9	21,282	(357)	3,423	24,348	6,539	2,865	544	451	34,747	3	104,241
E-8	18,017	(357)	3,155	20,815	5,490	2,850	544	451	30,140	6	180,840
E-7	15,431	(357)	2,822	17,973	4,672	2,743	544	451	26,383	14	369,362
E-6	12,939	(357)	2,637	15,169	3,261	2,459	544	451	22,564	45	1,012,680
E-5	10,537	(357)	2,217	12,447	3,080	1,886	544	451	15,438	46	846,768
E-4	9,311	(357)	1,766	10,720	2,654	1,638	544	451	16,017	40	640,280
E-3	8,451	(357)	1,474	9,608	2,389	1,480	544	451	14,472	24	1,360,368
TOT.											4,514,534
											24b

*An average enlistment and reenlistment bonus cost is incorporated in the Adjusted Standard Rate (ASR). This occupation-specific cost is deducted from the ASR and used in the occupation-specific cost calculations.

Table IV-13. ANNUAL LAMPS Mk III UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION (FY80 \$)*
Fleet Readiness Squadron

OCCUPATION TITLE	OCCUPATION CODE	TRAINING COSTS (\$)**	LOSS RATE	ANNUAL TRAINING COSTS (\$)	QUANTITY IN OCCUPATION	TOTAL ANNUAL TRAINING COSTS (\$)	ANNUAL BONUS & SP% ***	TOTAL ANNUAL COSTS BY OCCUPATION (\$)
Aviation Machinist's Mate	AD	3,476	.30	1,043	25	26,075	---	26,075
Aviation Electrician's Mate	AE	4,779	.32	1,529	16	24,464	---	24,464
Aviation Storekeeper	AK	4,425	.33	1,460	5	7,300	---	7,300
Aviation Structural Mechanic (Safety Equipment)	AME	5,503	.27	1,486	2	2,972	---	2,972
Aviation Structural Mechanic (Hydraulics)	AMH	4,599	.29	1,334	14	18,676	---	18,676
Aviation Structural Mechanic (Structures)	AMS	5,196	.28	1,453	24	34,872	---	34,872
Aviation Ordnanceman	AO	5,129	.35	1,795	2	3,590	---	3,590
Aviation Electronics Technician	AT	12,106	.33	3,995	14	55,930	5,959	61,789
Aviation Anti-Submarine Warfare Operator	AW	7,563	.31	2,345	26	69,970	24,450	85,420
Aviation Anti-Submarine Warfare Technician	AX	12,623	.31	3,916	15	58,740	---	58,740
Aviation Maint. Administration-man	AZ	3,601	.32	1,152	12	13,824	---	13,824
Distributing Clerk	DR	4,929	.34	1,510	---	---	---	---
Non-Flight Personnel	HM	5,343	.32	1,763	---	---	---	---
Non-Flight Personnel Support Unit	HC	4,116	.40	1,644	---	---	---	---
Personnel Clerk	PC	4,145	.34	1,411	7	9,577	1,387	11,964
Non-Flight Personnel Support Unit	PS	5,512	.32	1,764	4	7,456	7,456	7,456
Yield Control	PT	4,576	.37	1,693	11	17,623	1,693	19,316
Air Traffic Control	PTA****	3,294	.31	1,071	50	51,550	51,550	51,550
Aviation Supply Specialist	PSA	---	---	9	---	---	---	---
Property Control	PG	---	---	3	---	---	---	---
				244		344,574		344,574

* FY80 costs are based on FY80 personnel.

** Training Resource Model, dated.

*** Annual bonus rates are in Appendix B.

**** These are unclassified positions. The loss rate for P-1 through P-3 has been used in this calculation.

Table IV-14. FLEET READINESS SQUADRON ANNUAL OPERATING AND SUPPORT
MANPOWER COSTS- NAVY METHODOLOGY (FY80 \$)

COST ELEMENT	COST FACTOR (\$)	MANPOWER FACTOR	COST (\$)
UNIT MISSION PERSONNEL	--	--	--
● Pay and Allowances	11,341	248	2,812,568
INDIRECT PERSONNEL SUPPORT:			
● Miscellaneous O&M	512	248	126,976
● Medical O&M	246	248	61,008
● Permanent Change of Station	451	248	111,848
PERSONNEL ACQUISITION AND TRAINING			
● Acquisition	(68.44 + 82)	248	37,630
● Training	(2238 + 164)	248	595,814
TOTAL		--	3,745,844

cost per aircraft for the FRS (also 13 aircraft) using the MCR unit sustainment methodology is \$380,613 and \$288,142 using the Navy methodology. The difference in per aircraft costs between the FRS and the operational squadron is mainly due to the FRS having 248 personnel - 12 more than an operational squadron. It should be noted that the Navy does not use separate factors for the FRS but assumes the same cost per aircraft. However, since there are only two FRS squadrons versus eight operational squadrons, the increased manpower cost is fairly small. The increase per aircraft overall is \$3,723 annually or about 1% of manpower cost per aircraft.

E. GLCM MANPOWER COSTS

The GLCM manpower cost has been estimated using two procedures: the MCR unit sustainment methodology and the assumed Air Force methodology. In both instances the GLCM was costed using manpower strength estimates developed by the Tactical Air Command (TAC) for a minimum manning of 75 enlisted personnel per GLCM flight. Table II-16 provides a computed average quantity and average pay grade level for each proposed GLCM AFSC based on the minimum manning of 75 personnel per flight. No officers have been costed.

The quantity value which has been used is computed for the average pay grades of E-4 and E-5 for a flight. Although only pay grades E-4 and E-5 are actually costed, MCR included data for enlisted pay grades E-3 through E-9. This data can be used to calculate costs for the projected actual pay grades if and when the actual grade/AFSC structure is unclassified. This average approach is only used to avoid classifying this report. Average quantities have been computed by distributing the squadron requirements for each AFSC equally among the flights that will compose the squadron. For example, if four 427X4s were assigned to a squadron consisting of four

flights, it is assumed that one 427X4 would be assigned to each flight.

1. GLCM Manpower Costs Using the MCR-Developed Unit Sustainment Manpower Cost Methodology

This cost has been developed using an anticipated GLCM flight of 75 enlisted personnel. The occupation- and pay grade-specific data and calculations are provided in two tables: "Annual GLCM Unit Sustainment Manpower Costs by Pay Grade," Table IV-15; and "Annual GLCM Unit Sustainment Manpower Costs by Occupation," Table IV-16.

a. Manpower Costs by Pay Grade

Table IV-15 arrays costs by pay grade. All costs are in FY80 dollars. For the GLCM flight currently planned only average grades are available, E-4 and E-5, although pay grades E-3 through E-9 are shown with appropriate cost entries. The cost categories listed on this table are explained below:

- Pay and Allowances:
 - Adjusted Standard Rate (ASR) - The Composite Standard Rate is adjusted to exclude certain costs such as quarters. This is taken from the "Average Cost Handbook."
 - Enlistment and Reenlistment Bonuses - These bonuses were included in the ASR as an average cost of equal value for all pay grades. They are deducted from the ASR so as to be used in precise occupation-specific cost calculated in Table IV-15.
 - Quarters - This is taken from the "Average Cost Handbook."
 - Subtotal - This is a subtotal of three costs: ASR minus average bonuses plus quarters.
- Retirement - This is taken from the "Average Cost Handbook" and is pay grade-specific.
- Support - This is taken from the "Average Cost Handbook" and is pay grade-specific

Table IV-15. ANNUAL GLCM UNIT SUSTAINMENT MANPOWER COSTS BY PAY GRADE (FY80 \$)

PAY GRADE	PAY AND ALLOWANCES (\$)			RECRUITMENT (\$)	TOTAL (\$) QUANTITY BY PAY GRADE**	TOTAL ANNUAL COST BY PAY GRADE (\$)					
	ADJUSTED STANDBY RATE (+)	STANDBY RATE (-)	QUARTERS (+)								
E-3	21,820	(88)	3,447	25,179	6,899	2,540	136	817	35,971	--	--
E-2	13,292	(82)	3,182	21,396	5,714	3,059	136	817	31,152	--	--
E-1	12,561	(56)	2,956	18,546	4,310	3,044	136	817	27,373	--	--
F-2	12,561	(56)	3,763	15,920	4,057	2,646	136	817	23,616	--	--
F-1	12,561	(56)	2,411	13,406	3,303	2,315	136	817	15,917	17	333,699
E-4	3,152	(--)	1,962	1,452	2,112	1,745	16	217	16,517	\$2	952,676
E-5	1,833	(--)	1,517	9,741	2,391	1,245	16	817	14,341	--	--
E-6	1,833	(--)	1,517	9,741	2,391	1,245	16	817	14,341	--	--
										71	\$1,322,245

*Wages, allowances, and benefits for each pay grade are based on the standard rates for the pay grade. These rates are converted to FY80 dollars by applying the FY80 rate of exchange.

**Pay grades E-1 through E-4 are grouped together in the sustainment cost table because they have identical pay structures. Pay grades E-5 and E-6 have different pay structures. Their costs are listed separately.

Table IV-16. ANNUAL GLCM UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION (FY80 \$)

Occupation Title	Occupation Code	Training Costs (\$)	Loss Rate	Annual Training Costs (\$)	Annual Enlistment Bonus (\$)	Annual SRB (\$)	Individual Annual Costs (\$)	Quantity in Occupation	Total Annual Costs by Occupation (\$)
Radio Relay Equipment Repairman	304X0	6,492	.200	1,298	---	1,450	2,748	4	10,922
Missile Systems Analyst	316X0	7,348	.200	1,470	---	725	2,195	8	17,550
Maintenance Analyst Specialist	391X0	7,022	.132	927	---	---	927	1	9,757
Maintenance Management Specialist	392X0	5,087	.111	565	---	---	565	1	565
Aerospace Ground Equipment Mechanic	423X5	4,967	.171	849	---	---	849	4	3,396
Metal's Processing Specialist	427X4	4,993	.153	764	---	725	1,459	1	1,459
Missile Mechanic	443X0	3,012	.224	675	---	725	1,456	2	2,955
Munitions Systems Specialist	461X0	7,020	.174	1,221	---	---	1,221	2	2,442
Non-Tear Webbing Specialist	463X0	3,464	.190	647	---	1,450	2,147	1	2,147
Operational Maintenance Analyst Specialist	472X2	5,207	.062	323	---	1,450	1,773	1	1,773
Perfume Gas & Air Conditioning Specialist	545X0	4,457	.166	747	---	---	747	4	2,992
Protection Management Specialist	645X0	3,849	.157	604	---	---	604	1	604
Administrative Management Specialist	702X5	4,277	.189	898	---	---	898	2	1,696
Security Specialist	811X2	5,452	.257	2,387	---	---	2,387	3	7,161
				1672					145,235

*Some of these will be used but not both. MCP choose to cost 33.4% as it is the higher cost AFSC.

- Recruitment - This is calculated by dividing the total cost for FY80 of Recruiting and Advertising by the total number of non-prior service (NPS) accessions. The cost of \$1,006 was multiplied by the unit sustainment recruitment factor (overall enlisted loss rate) of 0.135 to arrive at the annual cost per person of \$136.
- Permanent Change of Station (PCS) - The FY80 PCS cost per manyear provided in the Military Personnel, Air Force FY82 POM Average Manyear Costs has been used. This is the same as the cost used in the Air Force methodology.
- Total - This is the total of all costs by pay grade.
- Quantity by Pay Grade - This is the total of enlisted personnel for the GLCM projected minimum flight. The average pay grades were derived from preliminary AFSC/grade requirements aggregated on a squadron basis. The conversion process consisted of two steps. The first step involved determining an average quantity for each AFSC on a flight basis. The second step involved determining an average grade level for each AFSC. For instance, if the four 427X4s consisted of two E-6s and two E-4s, an average grade level of E-5 would then be designated for that AFSC. The per flight average quantity for AFSCs with average grade levels were summed resulting in an average quantity of 17 E-4s and 58 E-5s in a flight.
- Total Annual Cost by Pay Grade - These are the total pay grade-specific costs for a GLCM flight. Since an average grade structure of only E-4 and E-5 is used, there are no values for the other grade levels. The total manpower costs by pay grade for a GLCM flight is \$1,322,245.

b. Manpower Costs by Occupation

Table IV-16 arrays occupation-specific costs.

All costs are in FY80 dollars. The cost categories listed on this table are explained below:

- Occupation Title - AFSC titles are taken from AFP 173-13.
- Occupation Code - Occupation is specified by AFSC. The first three characters specify career field; the fourth is skill level (shown by an "X" as these are all for journeyman-level personnel who have finished

technical training); the fifth character is for the precise occupation within a career field.

- Training Costs - This is the variable cost of training a specific AFSC to the journeyman level. All training costs are taken from the June 1980 update to AFP 173-13 and are in FY80 dollars. The cost of recruitment, travel, and clothing (\$1,486) was deducted to avoid double counting.
- Loss Rate - The loss rates or unit sustainment training factors are occupation-specific and were computed based on projected losses in each occupation for FY81. The projected losses span the entire career field and are not pay grade-specific. The unit sustainment factors used in this cost calculation are listed on Table IV-3.
- Annual Training Cost - This cost is calculated by multiplying the annual loss rate for each occupation by its total training cost.
- Annual Enlistment Bonus - No enlistment bonuses are paid to the AFSCs listed.
- Annual SRB - The selective reenlistment bonus (SRB) costs for eligible AFSCs is computed by multiplying the unit sustainment SRB factor by the average SRB cost for a specific zone and multiple level. The unit sustainment SRB factor of 0.25 was used based on the average Air Force reenlistment period of four years.
- Individual Annual Costs - This is the total of the training and SRB annual costs.
- Quantity in Occupation - This is the quantity by AFSC for one GLCM flight based on TAC estimates for a minimum flight received from AF/MPP in October 1980.
- Total Annual Cost by Occupation - These are the total occupation-specific costs for a GLCM flight and are the product of the individual annual cost of each AFSC times the quantity of personnel in each AFSC. The total GLCM occupation-specific cost is \$148,235.

2. GLCM Manpower Costs Using the Air Force Methodology

The GLCM weapon system was costed using an assumed Air Force methodology. Cost elements pertinent to manpower are provided in Table III-4 (taken from AFP 173-13).

The following explanation addresses the cost categories on Table IV-17 and relates them to the Air Force Cost Element Structure. Sources of data are provided for each entry description. The Air Force methodology is an average cost approach and the values for each AFSC are identical except for specialty training.

- AFSC - These are the AFSCs found in the GLCM flight.
- Unit Mission Personnel Cost - A pay factor of \$11,685 is used for all AFSCs. This amount represents the pay and allowances for one enlisted man/year for FY80. This value represents a per capita share of the entire Air Force Military Personnel appropriation less PCS costs. This data has been provided by AF/ACB.
- Indirect Personnel Support:
 - Miscellaneous Operations and Maintenance (Misc. O&M) - The value is the FY80 miscellaneous O&M rate per man/year. This cost was provided by the Air Force Cost Analysis Division (AF/ACMC) as the one used in costing weapon systems. This is the Base Operations non-pay factor from AFP 173-13 for FY80.
 - Medical O&M Non-Pay - This cost is the FY80 O&M rate per man/year and was also provided by AF/ACMC. This is the medical non-pay factor from AFP 173-13 for FY80.
 - PCS - This value is the FY80 PCS cost per man-year and was provided by AF/ACB.
- Personnel Acquisition and Training:
 - Training Costs - This value is provided in AFP 173-13 as the variable cost per individual Air Force specialty. This amount includes acquisition cost, cost of formal training, and leave costs. The acquisition portion of this cost element includes Recruitment, Initial Clothing Issue, Accession, Travel and Recruit Training (including trainee pay and allowances). The formal training portion is composed of the cost per graduate from each formal training course which an individual attends in becoming qualified at the basic skill level for each AFSC.
 - Loss Rate - This is the average enlisted turnover factor (.135) used by the Air Force in the estimation of costs and is provided in AFP 173-13.

Table IV-17. GLCM ANNUAL OPERATING AND SUPPORT MANPOWER COSTS - AIR FORCE METHODOLOGY (FY80 \$)

AFSC	UNIT MISSION PERSONNEL COST(\$)	IN-CRECT PERSONNEL SUPPORT		PERSONNEL ACQUISITION & TRAINING			SUB TOTAL	QUANTITY	TOTAL	
		NON-PAY (\$)	PCS (\$)	TRAINING COSTS	LOSS RATE	(\$)				
304X0	11,685	963	201	817	.135	1,077	14,743	4	56,372	
316X0	11,685	963	201	817	.834	1,193	14,859	8	118,872	
391X0	11,685	963	201	817	.508	1,149	14,815	1	14,815	
392X0	11,685	963	201	817	.573	1,135	887	14,553	1	14,553
423X5	11,685	963	291	817	6,453	.135	871	14,537	4	58,148
427X4	11,635	963	201	817	6,479	.135	875	14,541	1	14,541
441X5	11,635	963	261	817	4,493	.135	607	14,273	2	28,546
461X3	11,625	963	251	817	8,506	.135	1,148	14,814	2	29,628
463X5	11,625	963	201	817	4,890	.135	660	14,326	1	14,326
472X4	11,625	963	201	817	6,613	.135	904	14,570	1	14,570
541X3	11,625	963	201	817	5,493	.135	808	14,474	4	57,144
542X3	11,625	963	261	817	5,531	.135	747	14,413	1	14,413
543X3	11,625	963	201	817	5,717	.135	778	14,441	2	28,882
544X3	11,625	963	261	817	5,642	.135	735	14,410	43	59,370
545X3	11,625	963	201	817	5,531	.135	747	14,413	75	1135,436

- Cost - This is the product of the acquisition and training cost and the annual loss rate.
- Subtotal - This is the sum of the Unit Mission Personnel Cost, Indirect Personnel Support Costs, and Personnel Acquisition and Training Costs.
- Quantity - This is the quantity of each AFSC in a GLCM flight.
- Total - Each AFSC total cost represents the subtotal cost for each AFSC times the quantity for that AFSC. The overall total for the 75 enlisted personnel in a GLCM flight is \$1,116,432.

3. Comparison of Manpower Costs

Table IV-18 presents a comparison of the annual cost of a minimum GLCM flight of 75 enlisted personnel. The comparison is between the MCR-developed methodology and the Air Force methodology.

The cost elements used in both methods are essentially the same except that MCR's methodology includes costs for retirement and SRBs. In order to make a valid comparison, retirement cost and SRB cost are added separately.

The following paragraphs describe the entries on a cost category basis beginning at the top of Table IV-18:

- Pay and Allowances - MCR used E-4 and E-5 pay and allowance factors. The Air Force uses an overall enlisted pay and allowance factor.
- Support - This is an O&M cost; it is directly relatable to Miscellaneous O&M (which is base operating support) and Medical O&M.
- Recruitment and Training (MCR Methodology) - This compares with Acquisition and Specialty Training (Air Force methodology) which is approximately the same. The Air Force Recruitment cost includes initial clothing cost which may be included in the Unit Mission Personnel cost as well. The Air Force calculates Specialty Training costs by occupation; hence we used the AFP 173-13 costs. This includes the cost of Recruit Training, Initial Skill Training, and Skill Progression Training.

Table IV-18. COMPARISON OF ANNUAL GLCM MANPOWER COST (FY20 5,
Manpower Costs for One GLCM Flight

Category	Number of Personnel	Annual Manpower Cost (\$)
Flight Crew	1	1,000
Aircrew	2	2,000
Starters	1	1,000
Support Personnel	2	2,000
Surveillance	1	1,000
Starters	1	1,000
Personnel	1	1,000
Total	7	7,000
Personnel	7	7,000
Total	17	17,000
Personnel	17	17,000
Total	24	24,000
Personnel	24	24,000
Total	31	31,000
Personnel	31	31,000
Total	38	38,000
Personnel	38	38,000
Total	45	45,000
Personnel	45	45,000
Total	52	52,000
Personnel	52	52,000
Total	59	59,000
Personnel	59	59,000
Total	66	66,000
Personnel	66	66,000
Total	73	73,000
Personnel	73	73,000
Total	80	80,000
Personnel	80	80,000
Total	87	87,000
Personnel	87	87,000
Total	94	94,000
Personnel	94	94,000
Total	101	101,000
Personnel	101	101,000
Total	108	108,000
Personnel	108	108,000
Total	115	115,000
Personnel	115	115,000
Total	122	122,000
Personnel	122	122,000
Total	129	129,000
Personnel	129	129,000
Total	136	136,000
Personnel	136	136,000
Total	143	143,000
Personnel	143	143,000
Total	150	150,000
Personnel	150	150,000
Total	157	157,000
Personnel	157	157,000
Total	164	164,000
Personnel	164	164,000
Total	171	171,000
Personnel	171	171,000
Total	178	178,000
Personnel	178	178,000
Total	185	185,000
Personnel	185	185,000
Total	192	192,000
Personnel	192	192,000
Total	199	199,000
Personnel	199	199,000
Total	206	206,000
Personnel	206	206,000
Total	213	213,000
Personnel	213	213,000
Total	220	220,000
Personnel	220	220,000
Total	227	227,000
Personnel	227	227,000
Total	234	234,000
Personnel	234	234,000
Total	241	241,000
Personnel	241	241,000
Total	248	248,000
Personnel	248	248,000
Total	255	255,000
Personnel	255	255,000
Total	262	262,000
Personnel	262	262,000
Total	269	269,000
Personnel	269	269,000
Total	276	276,000
Personnel	276	276,000
Total	283	283,000
Personnel	283	283,000
Total	290	290,000
Personnel	290	290,000
Total	297	297,000
Personnel	297	297,000
Total	304	304,000
Personnel	304	304,000
Total	311	311,000
Personnel	311	311,000
Total	318	318,000
Personnel	318	318,000
Total	325	325,000
Personnel	325	325,000
Total	332	332,000
Personnel	332	332,000
Total	339	339,000
Personnel	339	339,000
Total	346	346,000
Personnel	346	346,000
Total	353	353,000
Personnel	353	353,000
Total	360	360,000
Personnel	360	360,000
Total	367	367,000
Personnel	367	367,000
Total	374	374,000
Personnel	374	374,000
Total	381	381,000
Personnel	381	381,000
Total	388	388,000
Personnel	388	388,000
Total	395	395,000
Personnel	395	395,000
Total	402	402,000
Personnel	402	402,000
Total	409	409,000
Personnel	409	409,000
Total	416	416,000
Personnel	416	416,000
Total	423	423,000
Personnel	423	423,000
Total	430	430,000
Personnel	430	430,000
Total	437	437,000
Personnel	437	437,000
Total	444	444,000
Personnel	444	444,000
Total	451	451,000
Personnel	451	451,000
Total	458	458,000
Personnel	458	458,000
Total	465	465,000
Personnel	465	465,000
Total	472	472,000
Personnel	472	472,000
Total	479	479,000
Personnel	479	479,000
Total	486	486,000
Personnel	486	486,000
Total	493	493,000
Personnel	493	493,000
Total	500	500,000
Personnel	500	500,000
Total	507	507,000
Personnel	507	507,000
Total	514	514,000
Personnel	514	514,000
Total	521	521,000
Personnel	521	521,000
Total	528	528,000
Personnel	528	528,000
Total	535	535,000
Personnel	535	535,000
Total	542	542,000
Personnel	542	542,000
Total	549	549,000
Personnel	549	549,000
Total	556	556,000
Personnel	556	556,000
Total	563	563,000
Personnel	563	563,000
Total	570	570,000
Personnel	570	570,000
Total	577	577,000
Personnel	577	577,000
Total	584	584,000
Personnel	584	584,000
Total	591	591,000
Personnel	591	591,000
Total	598	598,000
Personnel	598	598,000
Total	605	605,000
Personnel	605	605,000
Total	612	612,000
Personnel	612	612,000
Total	619	619,000
Personnel	619	619,000
Total	626	626,000
Personnel	626	626,000
Total	633	633,000
Personnel	633	633,000
Total	640	640,000
Personnel	640	640,000
Total	647	647,000
Personnel	647	647,000
Total	654	654,000
Personnel	654	654,000
Total	661	661,000
Personnel	661	661,000
Total	668	668,000
Personnel	668	668,000
Total	675	675,000
Personnel	675	675,000
Total	682	682,000
Personnel	682	682,000
Total	689	689,000
Personnel	689	689,000
Total	696	696,000
Personnel	696	696,000
Total	703	703,000
Personnel	703	703,000
Total	710	710,000
Personnel	710	710,000
Total	717	717,000
Personnel	717	717,000
Total	724	724,000
Personnel	724	724,000
Total	731	731,000
Personnel	731	731,000
Total	738	738,000
Personnel	738	738,000
Total	745	745,000
Personnel	745	745,000
Total	752	752,000
Personnel	752	752,000
Total	759	759,000
Personnel	759	759,000
Total	766	766,000
Personnel	766	766,000
Total	773	773,000
Personnel	773	773,000
Total	780	780,000
Personnel	780	780,000
Total	787	787,000
Personnel	787	787,000
Total	794	794,000
Personnel	794	794,000
Total	801	801,000
Personnel	801	801,000
Total	808	808,000
Personnel	808	808,000
Total	815	815,000
Personnel	815	815,000
Total	822	822,000
Personnel	822	822,000
Total	829	829,000
Personnel	829	829,000
Total	836	836,000
Personnel	836	836,000
Total	843	843,000
Personnel	843	843,000
Total	850	850,000
Personnel	850	850,000
Total	857	857,000
Personnel	857	857,000
Total	864	864,000
Personnel	864	864,000
Total	871	871,000
Personnel	871	871,000
Total	878	878,000
Personnel	878	878,000
Total	885	885,000
Personnel	885	885,000
Total	892	892,000
Personnel	892	892,000
Total	899	899,000
Personnel	899	899,000
Total	906	906,000
Personnel	906	906,000
Total	913	913,000
Personnel	913	913,000
Total	920	920,000
Personnel	920	920,000
Total	927	927,000
Personnel	927	927,00

- Permanent Change of Station (PCS) - This cost is the same for both methodologies, since the Air Force cost was used for both.
- SRB - This cost is based on the Air's awarded specific SRBs. The Air Force methodology incorporates this in pay and allowances.
- Total - The MCR methodology shows an annual manpower cost for one GLCM flight that is \$134,797 higher than the costs computed using the Air Force methodology. When retirement costs are included, this difference is increased to \$354,044. This is primarily due to higher support and training costs using the MCR cost factors. The MCR SRB cost is included in the Air Force Unit Mission Personnel factor for pay and allowance cost. The Retirement cost is not included in Air Force costs.

4. Observations

The Air Force cost factors and precise approach to costing the GLCM currently have not been determined. The standard cost element structure will be followed. It appears that using the costs in AFP 173-13 with occupation-specific loss factors provides improved estimates. The Air Force average turnover factor of 13.5% is much lower than the factors for most GLCM occupations. The manpower costs produced using the MCR methodology were 11% higher than the manpower costs produced using the Air Force methodology. MCR used pay grade-specific costs whereas the Air Force used an average pay grade cost. The inclusion of retirement cost adds another 21%.

F. CONCLUSIONS

The following are the key conclusions reached as a result of comparing the unit sustainment costs to the results produced using the various Service methodologies:

- There are two major reasons why weapon system unit manpower costs developed using the unit sustainment manpower cost methodology are higher than the costs developed with the Service methodologies:
 - The use of occupation- and pay grade-specific costs rather than average costs; and
 - The inclusion of retirement costs, which is the single largest reason for differences between costs developed with the MCR methodology and those developed using the Service methodologies.
- In those cases where the Service methodologies use occupation- and pay grade-specific data, the estimates for that element are close to MCR's. However, the use of different factors or the inclusion of additional cost elements (e.g., bonus and retirement costs for the M-1 calculations) in the MCR methodology resulted in higher costs than Service estimates. Specifically:
 - The M-1 manpower costs, excluding bonus and retirement costs, were very close (within 1%). This is due to the Army derivation of precise occupation- and pay grade-specific costs for pay and allowances and personnel replacement (recruitment and training). However, the inclusion of retirement and bonus costs increased the total cost using the MCR methodology by 22%.
 - The LAMPS Mk III costs, excluding retirement, are 15% higher using the MCR methodology. This is due to the use of pay grade-specific, rather than average, pay and allowance and support data. The inclusion of retirement costs increased the estimate by 21%.
 - The GLCM manpower costs, excluding retirement, are 12% higher using the MCR methodology. This is due to the use of pay grade-specific, rather than average, support cost and pay and allowances as well as the use of occupation-specific, rather than Service-wide, loss rates to calculate annual training costs. The inclusion of retirement increased the estimate by 20%.

V. DISCUSSION OF THE UNIT MANPOWER LIFE CYCLE COST METHODOLOGY

This section presents:

- a description of the unit manpower life cycle cost methodology; and
- a demonstration of this methodology using LAMPS Mk III manpower requirements data.

A. DESCRIPTION OF THE UNIT MANPOWER LIFE CYCLE COST METHODOLOGY

The overall purpose of this study effort has been to develop a unit manpower life cycle cost methodology. As discussed briefly in Section III, this methodology is composed of two parts:

- The initial unit manpower cost methodology, developed in Phase I of this study, which is used to calculate the costs of initially acquiring the unit manpower; and
- The unit sustainment manpower cost methodology, developed in Phase II of this study, which is used to calculate the annual costs of the manpower required to operate and maintain the system in the unit. This methodology has been described in detail in Section III and demonstrated in Section IV.

In this section the relationship of these two methodologies is described and demonstrated using the manpower data for one LAMPS Mk III operational squadron.

The initial unit manpower cost methodology uses element structures similar to those used in the unit sustainment cost methodology. The primary difference is the cost element structure. The initial unit manpower cost elements contain only those elements identified with manpower acquisition costs. In calculating these one-time manpower costs, lump-sum, rather than amortized costs, are used for the four cost elements. Table V-1 shows the relationship of the cost elements for the two methodologies. The following is a brief definition of the cost elements for initial unit manpower.

Table V-1. UNIT MANPOWER LIFE CYCLE COST METHODOLOGY

INITIAL UNIT MANPOWER COST ELEMENTS		UNIT SUSTAINMENT MANPOWER COST ELEMENTS		
(Manpower Acquisition Phase)		Recurring Acquisition Costs*	(Operating and Support Phase)	Annual Unit Sustainment Costs
●	General Costs**	● General Costs**	● Pay Grade-Specific Costs	● General Costs**
-	Recruitment	- Recruitment	- Permanent Change of Station (PCS)	- Pay and Allowances
●	Occupation-Specific Costs	● Occupation-Specific Costs	- Pay and Allowances	- Retirement
-	Enlistment Bonus	- Enlistment Bonus	- Selective Reenlistment Bonus (SRB)	- Support
-	Selective Reenlistment Bonus (SRB)	- Selective Reenlistment Bonus (SRB)	- Training	- Incentive and Special Pay (ISP - not included in demonstration)
-	Training			

* Amortized costs calculated using unit sustainment (personnel loss rate) factors. These occur at intervals dependent on loss rates.

** Non-occupation or pay grade-specific costs.

Initial Unit Manpower Cost Elements:

- General Costs - a cost that is not occupation- or pay grade-specific. The one cost item is:
 - Personnel Recruitment - the cost of enlisted recruitment and/or officer acquisition. This cost is derived from FY80 budget data from the Five Year Defense Plan data of October 1980.
- Occupation-Specific Costs which include:
 - Enlistment Bonus - this is the cost of awarding enlistment bonuses to personnel enlisting in specific occupations experiencing recruiting problems. This is also a pay grade specific cost since only personnel in lower pay grades can qualify to receive enlistment bonuses. Bonuses are used as an inducement to personnel to enlist in particular occupations. Enlistment bonus data is obtained from the Services.
 - Selective Reenlistment Bonus (SRB) - this is the cost of awarding SRBs to personnel reenlisting in specific occupations experiencing personnel retention problems. This is also a pay grade-specific cost since only personnel in higher pay grades can qualify to receive SRBs. SRBs are used as an inducement to personnel to reenlist in certain occupations in order to retain a required level of experience. SRB data is obtained from the Services.
 - Training - this is the cost related to recruit, initial skill and skill progression training. In the case of the Navy, initial skill training costs have been used as a surrogate for the skill progression training costs. These costs are obtained from the Services.

B. DEMONSTRATION OF THE UNIT MANPOWER LIFE CYCLE COST METHODOLOGY

This demonstration combines Phase I and Phase II into a life cycle methodology. Calculation of unit manpower life cycle costs involves the use of both of these methodologies, applied to unit manpower requirements data. The initial unit manpower cost is a one-time cost, based on applying the lump-sum costs to all of the members of the unit. The unit sustainment cost is

developed for one year and must be multiplied by the number of years in the system's projected operating cycle in order to obtain the unit's total manpower operating and support (or unit sustainment) costs in constant dollars. This total is then added to the previously calculated initial unit manpower cost to produce the unit manpower life cycle cost (LCC) in constant dollars.

In order to demonstrate the LCC methodology, calculations have been made using data for one LAMPS Mk III operational squadron. Table V-2 shows the data used in calculating the initial unit manpower costs. Tables V-3 and V-4 (duplicates of those found in Section IV) show the unit sustainment cost calculations.

Based on these calculations, the projected life cycle cost for one LAMPS Mk III operational squadron is as follows:

	CONSTANT FY80
	<u>\$ (000s)</u>
Annual Unit Sustainment Manpower Cost	
Pay Grade-Specific Costs (Table V-3)	4,268.7
Occupation-Specific Costs (Table V-4)	+ 462.5

	\$ 4,731.2
	x 20 (years)
Total Unit Sustainment Manpower Cost	-----
Initial Unit Manpower Cost (Table V-2)	\$94,624.0
	+ 2,407.4
LIFE CYCLE COST	-----
	\$97,031.4

The initial unit costs are minor compared to unit sustainment costs.

Table V-2. LAMPS Mk III INITIAL UNIT MANPOWER COSTS (FY80 \$)
Lamps Mk III Operational Squadron

Occupation Title	Occupation Code	Training Costs (\$)*	Enlistment Bonus (\$)**	Selected Enlistment Bonus (\$)**	Recruitment (\$)	Total (\$)	Quantity	Total (\$)
Aviation Machinist's Mate	AD	3,476	--	--	1,496	4,962	31	163,922
Aviation Electrician's Mate	AE	4,779	--	--	1,436	6,255	36	167,960
Aviation Storekeeper	AS	4,425	--	--	1,456	5,911	2	47,265
Aviation Structural Mechanic (Safety Engineer)	ANE	5,593	--	--	1,496	6,989	4	6,989
Aviation Structural Mechanic (Hydraulics)	AMH	4,599	--	--	1,486	6,075	15	91,125
Aviation Structural Mechanic (Structures)	AMS	5,150	--	--	1,487	6,677	11	73,447
Aviation Trainer	AT	5,151	--	--	1,487	6,678	1	6,678
Aviation Electronics Technician	AT	5,151	--	--	1,487	6,678	1	6,678
Aviation Anti-Submarine Warfare Operator	AW	7,547	--	--	7,212	21,164	2	42,328
Aviation Anti-Submarine Warfare Trainer	AY	12,535	--	--	12,535	25,070	1	25,070
Aviation Materiel Administrator	AP	2,671	--	--	2,671	5,342	1	5,342
Aviation Supply Clerk	DC	4,226	--	--	4,226	8,452	1	8,452
Aviation Supply Clerk	HW	5,945	--	--	5,945	11,890	1	11,890
Aviation Maintenance Specialist	MS	4,837	--	--	4,837	9,674	1	9,674
Aviation Maintenance Specialist	PA	4,339	--	--	4,339	8,678	1	8,678
Aviation Maintenance Specialist	PB	5,517	--	--	5,517	11,034	1	11,034
Aviation Maintenance Specialist	PS	4,837	--	--	4,837	9,674	1	9,674
Aviation Maintenance Specialist	PT	4,339	--	--	4,339	8,678	1	8,678
Aviation Maintenance Specialist	RA	4,339	--	--	4,339	8,678	1	8,678

LAMPS Mk III Operational Squadron

Table V-3. ANNUAL LAMPS Mk III UNIT SUSTAINMENT MANPOWER COSTS BY PAY GRADE (FY80 \$)

PAY GRADE	PAY AND ALLOWANCES (\$)			RETIREE (\$)	SUPPLYPT (\$)	DECOMMISSION (\$)	PCS (\$)	TOTAL (\$)	QUANTITY BY PAY GRADE	TOTAL COST BY PAY GRADE (\$)	
	ADJUSTED STANDARD RATE (+)	EXISTING & REFINERIEST MENT SCAFF- ES (-)*	QUARTERS (+)								
E-9	21,282	(357)	3,423	24,348	6,539	2,475	544	451	34,747	2	69,244
E-8	18,017	(357)	3,155	20,815	5,492	2,550	544	451	30,142	4	120,561
E-7	15,431	(357)	2,839	17,373	4,677	2,723	524	451	26,343	14	367,641
E-6	12,339	(357)	2,527	15,129	3,561	2,559	544	451	20,143	37	1,147,642
E-5	10,267	(357)	2,217	12,447	3,258	1,965	511	451	17,447	4	73,788
E-4	8,311	(357)	1,766	10,223	2,653	1,635	511	451	11,447	76	887,441
E-3	6,422	(357)	1,271	9,164	2,354	1,420	524	451	10,447	82	857,441
-TA											

*Pay adjustment and reclassification is incorporated in the Adjusted Standard Rate (ASR). This computation is based on the standard rate ASR and does not include cost factors, allowances, or benefits.

Table V-4. ANNUAL LAMPS Mk III UNIT SUSTAINMENT MANPOWER COSTS BY OCCUPATION*
Lamps Mk III Operational Squadron

OCCUPATION TITLE	OCCUPATION CODE	TRAINING COSTS (\$)*	LOSS RATE	ANNUAL TRAINING COSTS (\$)	QUANTITY IN OCCUPATION	TOTAL ANNUAL TRAINING COSTS (\$)	ANNUAL BONUS & SPB (\$),***	TOTAL ANNUAL COSTS BY OCCUPATION (\$)
Aviation Machinist's Mate	AD	3,476	.30	1,043	31	32,333	---	32,333
Aviation Electrician's Mate	AE	4,775	.32	1,529	30	45,870	---	45,870
Aviation Storekeeper	AK	4,425	.33	1,460	8	11,680	---	11,680
Aviation Structural Mechanic (Safety Equipment)	AMC	5,503	.27	1,486	1	1,486	---	1,486
Aviation Structural Mechanic (Hydraulics)	AMH	4,599	.29	1,334	15	20,010	---	20,010
Aviation Structural Mechanic (Structures)	AMS	5,190	.28	1,453	17	24,701	---	24,701
Aviation Ordnanceman	AC	5,129	.35	1,795	3	5,385	---	5,385
Aviation Electronics Technician	AT	12,106	.33	3,995	16	63,920	11,719	75,638
Aviation Anti-Submarine Warfare Operator	AW	7,563	.31	2,345	29	68,005	46,077	114,082
Aviation Anti-Submarine Warfare Technician	AX	12,633	.31	3,916	16	62,656	---	62,656
Aviator Maint. Administration	AI	3,631	.32	1,152	8	9,216	---	9,216
Flight Navigator	EN	4,523	.34	1,540	1	1,540	---	1,540
Mech. Navigator (Anti-Sub. W.F.)	HQ	5,343	.33	1,763	1	1,763	---	1,763
Mech. Navigator (Anti-Air)	N2	4,111	.40	1,644	4	6,576	8,343	14,919
Reconnaissance Pilot	P*	4,147	.34	1,411	5	7,055	7,055	14,110
Aviation Surgeon (Flight Physician)	PS	5,512	.32	1,764	2	3,528	---	3,528
Refugee	Y1	4,575	.37	1,672	8	13,536	13,536	27,072
Administrative Clerk	ACU*****	3,214	.34	1,041	22	27,442	17,442	44,884
Aviator Driver (Pilot)	AP	2,214	---	7	2	14,728	14,728	29,456
Petty Officer	PO	2	---	2	2	4,572	4,572	9,144

*Occupation costs are based on the cost of the most expensive occupation in each category. The loss rate for E-1 through E-3 has been used in these calculations.

**Annual Bonus and Special Pay Based on Current Rates.

***Annual Bonus and Special Pay Based on Current Rates.

VI. APPLICATION OF MCR-DEVELOPED TOOLS

The recent direction in DoD management philosophy to decentralize policy execution and to shorten the acquisition process requires improved methods for DoD-wide performance evaluation and monitoring. Currently, the DSARC Milestone documentation in DoDI 5000.2 (dated 19 March 1980) requires submission of a document entitled the Integrated Program Summary (IPS). The IPS accompanies the Decision Coordinating Paper (DCP) and is used to explain weapon system resources (cost), manpower, and logistics requirements. Although the IPS requirements may change in the future, the necessity for assessing the impact of new weapon systems on Service manpower resources will remain.

This section presents a discussion of:

- DSARC manpower requirements
- Application of MCR methods
- Conclusions
- Recommendations

A. DSARC MANPOWER REQUIREMENTS

The specific requirements of each DSARC milestone, as currently defined in the IPS instructions, are summarized below.

At DSARC Milestone I:

- identify alternative manpower employment concepts for the weapon system and summarize manpower sensitivities to these alternative employment concepts; and
- identify parameters and innovative concepts to be analyzed and then presented at DSARC Milestone II.

At DSARC Milestone II:

- summarize projected requirements versus projected Service assets in critical career fields;
- identify new occupations which may be required;

- provide a summary by fiscal year and occupation of all formal training requirements for the proposed system, identifying numbers of personnel to be trained and training cost;
- identify the contractor support and depot workload requirements in terms of manhours per end item; and
- identify the net change in total force manpower associated with the proposed system in terms of active forces, reserve forces, and DoD civilians.

These DSARC Milestone II estimates are to be refined by DSARC Milestone III, and in addition, the following analyses are required:

- identify shortfalls in meeting requirements by occupation;
- assess the impact on system readiness of failure to obtain required personnel;
- identify new occupations not yet programmed into Service personnel and training systems; and
- summarize plans for attaining and maintaining the required proficiency of operating and support personnel.

The intention of the IPS analyses is to allow decision-makers the opportunity to evaluate the impact of new system requirements on projected resources and force structures.

From the perspective of manpower requirements and costs, DSARC Milestone I is clearly an appropriate point to begin analysis and documentation of detailed manpower requirements and costs.

The impending changes in the acquisition process are intended to shorten the cycle and reduce costs. The improved DSARC review may streamline documentation as currently prescribed for the IPS; however, the need to address the crucial manpower impacts will remain.

B. APPLICATION OF MCR METHODS

OASD (MRA&L) developed the "Hardware-Manpower Balance" project in order to examine the relationship of hardware design, acquisition decisions, and manpower constraints. The tools developed by MCR during this project address two critical resources of weapon system acquisition: manpower and dollars. Manpower for weapon systems must be acquired, trained and sustained. Weapon system manpower costs are directly influenced by the type of manpower required by the system. This has been demonstrated by the high-cost/critical occupation definition and the unit manpower cost methodology developed and presented in this report.

The definition and cost methodology developed during this project have been tailored to provide a coordinated approach to analyzing the manpower impacts of system demands. As demonstrated in this report, much valuable information can be obtained by analyzing the detailed unit manpower requirements. The high-cost/critical occupation definition allows for the evaluation of occupation and pay grade requirements in terms of three primary characteristics:

- system mission essentiality,
- costs, and
- inventory status.

The unit manpower cost methodology permits the detailed analysis of occupation- and pay grade-specific costs for weapon systems in the context of the units in which they are deployed.

Benefits which would be derived from applying the occupation- and pay grade-specific definition and methodology are summarized below.

- Insights can be gained about potential manpower problems such as:
 - excessive requirements for highly experienced senior personnel

- requirements for occupations which are already experiencing inventory shortages; and
 - requirements in mid-level pay grades which are already experiencing inventory shortages.
- System occupations with extremely specialized training requirements, and having limited potential for utilization on other systems, can be identified and examined.
- The requirement for occupations which require long training periods or are very expensive to develop, can be evaluated.
- The potential cost advantages of cross-training, personnel experienced on similar systems can be examined.
- The broader impacts of the relationship of system design to occupation and pay grade requirements, and any alternative to these approaches can be analyzed.

C. CONCLUSIONS

The following conclusions have been reached based on the application of the high-cost/critical occupation definition and the unit manpower cost methodology to actual weapon system data.

- Based on the limited sample analyzed (one weapon system for each Service), it is not possible to determine if the kinds of relationships identified in these analyses are exceptions or the norm. Although we suspect they are the norm, however, application of the definition and cost methodology to a larger group of weapon systems would allow definitive conclusions to be made.
- It is necessary to examine the details of weapon system unit manpower requirements, since it is only through this process that the Services and DSD can identify exactly where potential problems exist. Evaluation of aggregated estimates makes this impossible and, frequently, obscures the fact that a problem exists.
- The utility of these tools is not only in the numbers they produce, but also in the examination of the detailed relationships among the various requirements and cost drivers.
- The analyses documented in this report indicate that each of the three weapon systems analyzed may experience substantial personnel problems (inventory shortage,

readiness) due to the quantity and quality of high-cost/critical personnel they require. The true magnitude of these problems can only be determined following an analysis of total Service projected assets and demands.

D. RECOMMENDATIONS

In Sections II and IV of this report, the application of the high-cost/critical occupation definition and unit manpower cost methodology has been demonstrated using the data for one major weapon system from each Service. The next phase of analysis should expand the application of the definition and methodology to the broader context of projected Service manpower resources and force structures.

MCR recommends that the tools developed during the project be used by the ASD(MRA&L) to encourage the success of Service efforts in achieving hardware manpower balance. Specifically, we recommend that OASD(MRA&L) develop an approach which can be used to analyze weapon system manpower requirements as early as possible (DSARC I if strengths are available). The weapon system manpower requirements, analyzed in terms of the definition of high-cost/critical occupations, should be examined in light of Service inventory projections and problem areas identified. This analysis should examine first the unit mission personnel and then be expanded to include requirements above mission unit and below depot level. The use of this approach should achieve the benefits detailed in Subsection VI.8 above. The results of analyses should be used to focus on alternative concepts for system manning. If the manning requirements cannot be changed (e.g., the occupation is mission essential), then a manpower acquisition strategy must be developed to ensure the availability of the required personnel. The approach will support analyses leading to decisions on manpower costs, hardware/manpower trade-offs or alternative manning concepts and manpower acquisition strategies.

APPENDIX A

REFERENCE SOURCES

APPENDIX A

Part 1. Interviews

<u>INDIVIDUAL</u>	<u>ORGANIZATION</u>	<u>ADDRESS</u>	<u>PHONE</u>
<u>OSD</u>			
MAJ Thomas May	PA&E (CA)	PNT 2D278	697-4311
<u>ARMY</u>			
MAJ Charles Calloway	DAPE-MPR	PNT 2B729	695-1463
Mr. Wayne Knox	DACA-CAW	PNT 2B685	697-3568
MAJ W.J. Marm	DAPE-MPR	PNT 2B725	695-7485
Mr. John Sincavage	DACA-CAC	PNT 2A680	695-6718
LTC K.R. Stuhlmuller	DAMO-RQR	PNT 2B543	697-5442
LTC Lanny Walker	MILPERCEN	HOFF I: 232	325-9770
LTC K.M. Woodbury	DAPE-MPE	PNT 2B745	695-4615
<u>NAVY</u>			
LCDR Richard DeJaegher	OP-112D	AA 1841	694-4974
LCDR Roger Hope	OP-136D	AA 2840	694-5512
Mr. Robert Houts	AIR-4105A	JP-2 448	692-7360
LT Paul Johnson	OP-135D	AA 2825	694-5445
Mr. James McCune	OP-136D	AA 1409	694-2035
LCDR J.J. Richardson	OP-135D	AA 2825	694-5445
<u>AIR FORCE</u>			
MAJ Richard Ely	AF/MP	PNT 5C469	695-4518
MAJ David Gallagher	AF/RDQB	PNT 5D327	694-3816
Ms. Arlene Gribben	AF/MPPPN	PNT 4E161	695-4066
CMS A.J. Kelly	HQS TAC		AV 432-2423
MAJ Jack Leonhardt	AF/MPPPN	PNT 4E161	697-6649
LTC Robert Owens	AF/ACM	PNT 4D212	697-0722
Mr. John Reece	AF/MPPPN	PNT 4E161	695-3434
MAJ Donald Sutton	AF/ACM	PNT 4D212	697-0791

APPENDIX A

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APPENDIX B

ADDITIONAL NAVY DATA

Table B-1. LAMPS Mk III ENLISTMENT BONUS AND SRB CALCULATIONS (FY80 \$)

OCCUPATION CODE	PAY GRADE	ENLISTMENT BONUS	ANNUAL ENLISTMENT BONUS	SELECTIVE REENLISTMENT BONUS		ANNUAL SRB	QUANTITY IN PAY GRADE	TOTAL ANNUAL BONUS AND SRB
				AWARD	LEV. & ZONE			
AT	E-4	--	--	A-3	7,812	1,953	6	11,718
AW	E-4	--	--	A-4	10,416	2,604	13	33,852
	E-6	--	--	B-3	9,778	2,445	5	12,225
MS	E-4	1500	375	A-3	7,812	1,953	1	2,328
	E-6	--	--	B-2	6,518	1,630	--	--
DN	E-4	--	--	A-1	2,604	651	1	651
								60,774
				TOTAL				

* Total Enlistment Bonus and SRB values have been divided by the Navy average reenlistment period of four years to obtain the annual cost.

Table B-2. LAMPS Mk III ENLISTMENT BONUS AND SRB CALCULATIONS (FY80 \$)

OCCUPATION CODE	PAY GRADE	ENLISTMENT BONUS	ANNUAL ENLISTMENT BONUS	SELECTIVE REENLISTMENT BONUS		ANNUAL SRB	QUANTITY IN PAY GRADE	TOTAL ANNUAL BONUS AND SRB
				AWARD LEV. & ZONE	SRB			
AT	E-4	--	--	A-3	7,812	1,953	3	5,859
AW	E-4	--	--	A-4	10,416	2,604	--	--
	E-6	--	--	B-3	9,778	2,445	10	24,450
MS	E-4	1500	375	A-3	7,812	1,953	--	--
	E-6	--	--	B-2	6,518	1,630	--	--
DN	E-4	--	--	A-1	2,604	651	2	1,302
TOTAL								31,611

*Total Enlistment Bonus and SRB values have been divided by the Navy average reenlistment period of four years to obtain the annual cost.

Table B-3. LAMPS Mk III PERSONNEL BY OCCUPATION AND PAY GRADE

1. Detachments

Table B-3. LAMPS Mk III PERSONNEL BY OCCUPATION AND PAY GRADE (Cont'd)

2. Shore-Based Component

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

Table B-3. LAMPS Mk III PERSONNEL BY OCCUPATION AND PAY GRADE (Cont'd)

3. Aviation Intermediate Maintenance Departments (AIMD)

A:	AF	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45	A46	A47	A48	A49	A50	A51	A52	A53	A54	A55	A56	A57	A58	A59	A60	A61	A62	A63	A64	A65	A66	A67	A68	A69	A70	A71	A72	A73	A74	A75	A76	A77	A78	A79	A80	A81	A82	A83	A84	A85	A86	A87	A88	A89	A90	A91	A92	A93	A94	A95	A96	A97	A98	A99	A100	A101	A102	A103	A104	A105	A106	A107	A108	A109	A110	A111	A112	A113	A114	A115	A116	A117	A118	A119	A120	A121	A122	A123	A124	A125	A126	A127	A128	A129	A130	A131	A132	A133	A134	A135	A136	A137	A138	A139	A140	A141	A142	A143	A144	A145	A146	A147	A148	A149	A150	A151	A152	A153	A154	A155	A156	A157	A158	A159	A160	A161	A162	A163	A164	A165	A166	A167	A168	A169	A170	A171	A172	A173	A174	A175	A176	A177	A178	A179	A180	A181	A182	A183	A184	A185	A186	A187	A188	A189	A190	A191	A192	A193	A194	A195	A196	A197	A198	A199	A200	A201	A202	A203	A204	A205	A206	A207	A208	A209	A210	A211	A212	A213	A214	A215	A216	A217	A218	A219	A220	A221	A222	A223	A224	A225	A226	A227	A228	A229	A230	A231	A232	A233	A234	A235	A236	A237	A238	A239	A240	A241	A242	A243	A244	A245	A246	A247	A248	A249	A250	A251	A252	A253	A254	A255	A256	A257	A258	A259	A260	A261	A262	A263	A264	A265	A266	A267	A268	A269	A270	A271	A272	A273	A274	A275	A276	A277	A278	A279	A280	A281	A282	A283	A284	A285	A286	A287	A288	A289	A290	A291	A292	A293	A294	A295	A296	A297	A298	A299	A300	A301	A302	A303	A304	A305	A306	A307	A308	A309	A310	A311	A312	A313	A314	A315	A316	A317	A318	A319	A320	A321	A322	A323	A324	A325	A326	A327	A328	A329	A330	A331	A332	A333	A334	A335	A336	A337	A338	A339	A340	A341	A342	A343	A344	A345	A346	A347	A348	A349	A350	A351	A352	A353	A354	A355	A356	A357	A358	A359	A360	A361	A362	A363	A364	A365	A366	A367	A368	A369	A370	A371	A372	A373	A374	A375	A376	A377	A378	A379	A380	A381	A382	A383	A384	A385	A386	A387	A388	A389	A390	A391	A392	A393	A394	A395	A396	A397	A398	A399	A400	A401	A402	A403	A404	A405	A406	A407	A408	A409	A410	A411	A412	A413	A414	A415	A416	A417	A418	A419	A420	A421	A422	A423	A424	A425	A426	A427	A428	A429	A430	A431	A432	A433	A434	A435	A436	A437	A438	A439	A440	A441	A442	A443	A444	A445	A446	A447	A448	A449	A450	A451	A452	A453	A454	A455	A456	A457	A458	A459	A460	A461	A462	A463	A464	A465	A466	A467	A468	A469	A470	A471	A472	A473	A474	A475	A476	A477	A478	A479	A480	A481	A482	A483	A484	A485	A486	A487	A488	A489	A490	A491	A492	A493	A494	A495	A496	A497	A498	A499	A500	A501	A502	A503	A504	A505	A506	A507	A508	A509	A510	A511	A512	A513	A514	A515	A516	A517	A518	A519	A520	A521	A522	A523	A524	A525	A526	A527	A528	A529	A530	A531	A532	A533	A534	A535	A536	A537	A538	A539	A540	A541	A542	A543	A544	A545	A546	A547	A548	A549	A550	A551	A552	A553	A554	A555	A556	A557	A558	A559	A560	A561	A562	A563	A564	A565	A566	A567	A568	A569	A570	A571	A572	A573	A574	A575	A576	A577	A578	A579	A580	A581	A582	A583	A584	A585	A586	A587	A588	A589	A590	A591	A592	A593	A594	A595	A596	A597	A598	A599	A600	A601	A602	A603	A604	A605	A606	A607	A608	A609	A610	A611	A612	A613	A614	A615	A616	A617	A618	A619	A620	A621	A622	A623	A624	A625	A626	A627	A628	A629	A630	A631	A632	A633	A634	A635	A636	A637	A638	A639	A640	A641	A642	A643	A644	A645	A646	A647	A648	A649	A650	A651	A652	A653	A654	A655	A656	A657	A658	A659	A660	A661	A662	A663	A664	A665	A666	A667	A668	A669	A670	A671	A672	A673	A674	A675	A676	A677	A678	A679	A680	A681	A682	A683	A684	A685	A686	A687	A688	A689	A690	A691	A692	A693	A694	A695	A696	A697	A698	A699	A700	A701	A702	A703	A704	A705	A706	A707	A708	A709	A710	A711	A712	A713	A714	A715	A716	A717	A718	A719	A720	A721	A722	A723	A724	A725	A726	A727	A728	A729	A730	A731	A732	A733	A734	A735	A736	A737	A738	A739	A740	A741	A742	A743	A744	A745	A746	A747	A748	A749	A750	A751	A752	A753	A754	A755	A756	A757	A758	A759	A760	A761	A762	A763	A764	A765	A766	A767	A768	A769	A770	A771	A772	A773	A774	A775	A776	A777	A778	A779	A780	A781	A782	A783	A784	A785	A786	A787	A788	A789	A790	A791	A792	A793	A794	A795	A796	A797	A798	A799	A800	A801	A802	A803	A804	A805	A806	A807	A808	A809	A810	A811	A812	A813	A814	A815	A816	A817	A818	A819	A820	A821	A822	A823	A824	A825	A826	A827	A828	A829	A830	A831	A832	A833	A834	A835	A836	A837	A838	A839	A840	A841	A842	A843	A844	A845	A846	A847	A848	A849	A850	A851	A852	A853	A854	A855	A856	A857	A858	A859	A860	A861	A862	A863	A864	A865	A866	A867	A868	A869	A870	A871	A872	A873	A874	A875	A876	A877	A878	A879	A880	A881	A882	A883	A884	A885	A886	A887	A888	A889	A890	A891	A892	A893	A894	A895	A896	A897	A898	A899	A900	A901	A902	A903	A904	A905	A906	A907	A908	A909	A910	A911	A912	A913	A914	A915	A916	A917	A918	A919	A920	A921	A922	A923	A924	A925	A926	A927	A928	A929	A930	A931	A932	A933	A934	A935	A936	A937	A938	A939	A940	A941	A942	A943	A944	A945	A946	A947	A948	A949	A950	A951	A952	A953	A954	A955	A956	A957	A958	A959	A960	A961	A962	A963	A964	A965	A966	A967	A968	A969	A970	A971	A972	A973	A974	A975	A976	A977	A978	A979	A980	A981	A982	A983	A984	A985	A986	A987	A988	A989	A990	A991	A992	A993	A994	A995	A996	A997	A998	A999	A1000	A1001	A1002	A1003	A1004	A1005	A1006	A1007	A1008	A1009	A10010	A10011	A10012	A10013	A10014	A10015	A10016	A10017	A10018	A10019	A10020	A10021	A10022	A10023	A10024	A10025	A10026	A10027	A10028	A10029	A10030	A10031	A10032	A10033	A10034	A10035	A10036	A10037	A10038	A10039	A10040	A10041	A10042	A10043	A10044	A10045	A10046	A10047	A10048	A10049	A10050	A10051	A10052	A10053	A10054	A10055	A10056	A10057	A10058	A10059	A10060	A10061	A10062	A10063	A10064	A10065	A10066	A10067	A10068	A10069	A10070	A10071	A10072	A10073	A10074	A10075	A10076	A10077	A10078	A10079	A10080	A10081	A10082	A10083	A10084	A10085	A10086	A10087	A10088	A10089	A10090	A10091	A10092	A10093	A10094	A10095	A10096	A10097	A10098	A10099	A100100	A100101	A100102	A100103	A100104	A100105	A100106	A100107	A100108	A100109	A100110	A100111	A100112	A100113	A100114	A100115	A100116	A100117	A100118	A100119	A100120	A100121	A100122	A100123	A100124	A100125	A100126	A100127	A100128	A100129	A100130	A100131	A100132	A100133	A100134	A100135	A100136	A100137	A100138	A100139	A100140	A100141	A100142	A100143	A100144	A100145	A100146	A100147	A100148	A100149	A100150	A100151	A100152	A100153	A100154	A100155	A100156	A100157	A100158	A100159	A100160	A100161	A100162	A100163	A100164	A100165	A100166	A100167	A100168	A100169	A100170	A100171	A100172	A100173	A100174	A100175	A100176	A100177	A100178	A100179	A100180	A100181	A100182	A100183	A100184	A100185	A100186	A100187	A100188	A100189	A100190	A100191	A100192	A100193	A100194	A100195	A100196	A100197	A100198	A100199	A100200	A100201	A100202	A100203	A100204	A100205	A100206	A100207	A100208	A100209	A100210	A100211	A100212	A100213	A100214	A100215	A100216	A100217	A100218	A100219	A100220	A100221	A100222	A100223	A100224	A100225	A100226	A100227	A100228	A100229	A100230	A100231	A100232	A100233	A100234	A100235	A100236	A100237	A100238	A100239	A100240	A100241	A100242	A100243	A100244	A100245	A100246	A100247	A100248	A100249	A100250	A100251	A100252	A100253	A100254	A100255	A100256	A100257	A100258	A100259	A100260	A100261	A100262	A100263	A100264	A100265	A100266	A100267	A100268	A100269	A100270	A100271	A100272	A100273	A100274	A100275	A100276	A100277	A100278	A100279	A100280	A100281	A100282	A100283	A100284	A100285	A100286	A100287	A100288	A100289	A100290	A100291	A100292	A100293	A100294	A100295	A100296	A100297	A100298	A100299	A100300	A100301	A100302	A100303	A100304	A100305	A100306	A100307	A100308</th

APPENDIX C

DEFINITIONS OF SERVICE
MANPOWER COST ELEMENTS

A. DEFINITIONS OF ARMY MANPOWER COST ELEMENTS:

3.011 Military Crew Pay and Allowances

Includes basic pay, BAQ, BAS, theater pay, special pay; excludes P&A for operators of other equipment in the force unit such as trucks and switchboards. Employs average annual basic P&A per crewman and average annual theater cost per crewman. For the XM-1 no special pay was recognized. Enlistment bonuses are not included in calculating this cost. SRB (Selected Reenlistment Bonuses) are also not included.

3.012 Military Maintenance Pay and Allowances

The same inclusions/exclusions are applied as noted above for the crew. The same average factors are used except as they apply specifically to maintenance personnel.

3.013 Military Indirect Pay and Allowances

Same inclusions/exclusions as for crew. Personnel are charged in the ratio of direct personnel for the system to all direct personnel for all systems in the force.

3.014 Permanent Change of Station Pay

Includes PCS travel paid to and from overseas theater and within CONUS from MPA appropriation -- costs of all chargeable personnel in the force; excludes costs of personnel allocated to other systems in the force structure.

3.031 Depot Maintenance Labor

Includes military and civilian labor for vehicle and component overhauls and repairs -- direct and indirect labor costs; excludes materiel and transportation. A theater depot labor costs per overhaul is applied which is based on theater labor rates.

3.061 Personnel Replacement

Includes MPA, OMA, and other personnel costs for MOS training costs, accession costs, separation costs; excludes

enlistment/reenlistment bonuses, cost of replacing depot main-
tenance and medical support personnel, RUMC and OMA costs.
Applies an average annual replacement cost per man factor to
the total crew/maintenance/indirect military personnel per
tank times an annual attrition rate.

3.062 Transients, Patients, Prisoners ~~(M)~~

Includes TPP costs for crew, maintenance, and indi-
rect personnel dedicated to the tank; excludes indirect per-
sonnel within a tracked vehicle battalion and US/GS maintenance
personnel for common support equipment. The AFPCN TPP factor
is applied to cost of crew, maintenance, and indirect per.

3.063 Quarters, Maintenance and Utilities ~~(M)~~

Includes cost for personnel living in government-owned
quarters or annual OMA cost of installation operations in sup-
port of force units; excludes fixed installation costs. Applies
average annual QMU cost per man for Europe and CONUS to total
number of dedicated personnel per weapon.

3.064 Medical Support

Includes OMA variable cost for medical/dental for
force unit (battalion); excludes cadets, retirees, medical
overhead, non-recurring Army medical costs. Applies average
annual per capita theater cost factor.

3.065 Other Indirect

Includes cost of Project Management Office, product
Improvement Office; theater costs for operation of schools for
dependents; special transportation costs and costs of general
supplies to force units which exist solely because of the sys-
tem being costed, per capita costs of supply system, Army ad-
ministration, Army personnel management, individual weapon
(training) qualification, and recurring unit operations and
recurring other procurements. Excludes non-recurring costs.
An annual theater cost factor is used.

B. DEFINITIONS OF NAVY MANPOWER COST MIL---

1. Definitions of the NARM manpower cost components are as follows:

- Direct Operating Manpower:
 - Officers Active Allowance = the average number of officers per aircraft in a program.
 - Enlisted Active Allowance = the average number of enlisted personnel per aircraft in a program.
 - NARM Officer Pay Factor = the weighted officer composite standard pay rates for AFTRs.
 - NARM Enlisted Pay Factor = the weighted composite standard pay rates for enlisted personnel.
 - Officer MPN Weight Factor = the factor used to percentage the average pay up or down based on actual past MPN expenditures for officers within each program element.
 - Enlisted MPN Weight Factor = the factor used to percentage the average pay up or down based on actual past MPN expenditures for enlisted personnel within each program element.
 - Annual Air TAD = the total travel and daily expenses of all squadron personnel assigned to an aircraft in a particular series who perform temporary additional duty.
- Indirect Operating Manpower:
 - Base Operations Officers and Enlisted = the total number of officers and enlisted personnel to operate and maintain bases.
 - Recruiting and Examining Activities, Officers and Enlisted = the total annual number of officers and enlisted who serve in positions related to either recruiting or examining prospective Navy enlisted entrants who will operate a particular type of ship or aircraft.
 - Health Activities, Officers and Enlisted = the number of officer and enlisted medical staff members allocated for each aircraft aircraft type. Includes the program elements referred "Care in Defense Facilities" and "Other Medical Activities."
 - Transients, Officer and Enlisted = the annual total man-years that personnel assigned to

staff or support personnel, or the movement of craft of a particular type between stations from one station to another. These moves may include the following:

- Accession moves
- Separation moves
- Training moves
- Operational moves
- Rotational moves
- Organized Unit moves

- Training, Officers and Enlisted - the number of man-years spent in training students who later serve as replacements for those separating from the Navy during the year. This factor also includes the number of staff who provide their training. Several types of training are involved as defined below.

- Readiness Training - an interim training period where personnel already in the Navy are given short refresher courses to familiarize them with an aircraft before being reassigned to one of the same type.
- Recruit Training - the period when all enlisted receive their initial training in boot camp.
- Officer Candidate Schools - provide training to potential Naval Officers who are not Naval Academy or NASSC graduates.
- Professional Military Education - provides college-level instruction to officers in advance military topics.
- General Skill Training - a period of technical training undertaken by officers and enlisted in a wide range of areas such as data processing, prototyping, and nuclear power.
- Other Professional Education - provides college-level instruction in non-military professional fields such as meteorology.
- Education and Training, Personnel - covers all types of medical, financial, educational and enlisted either maintained by the Navy in Service facilities or provided by the Navy in civilian institutions. This includes those personnel connected with scholarship and subsidy programs.

- Other health activities - medical services, dental services, officers and enlisted personnel training at various locations throughout the world. Service-sponsored medical and dental programs. These programs are designed to attract people to the Navy.
 - Fleet Support - the period immediately preceding deployment where the Navy and the Fleet Air Wings conduct courses for maintenance of aircraft and ships to be well prepared for deployment.
 - Training Support - the period immediately preceding deployment. This includes the preparation of training teams and maintenance of extension courses.
- Personnel holding, and personnel assigned - the annual total budgeted for personnel assigned to staff or assigned to ship or aircraft type are in a "hold" category.
 - PCS - the total number of personnel assigned to staff or assigned to ship or aircraft type assigned to ship.
- Operating Indirect Costs:
 - Logistics, OMN - the cost of the Defense Budget Activity (DBA) which will be allocated back to personnel assigned to aircraft types.
 - Base Operations Support - the cost of funds for maintaining bases and facilities assigned to ships or aircraft types.
 - Training, OMN - the cost of funds to maintain training facilities and personnel assigned to personnel to operate aircraft, ships, or aircraft.
 - Health Activities, OMN - the cost of funds to operate medical facilities and personnel assigned to enlisted personnel assigned to ships or aircraft.
 - Recruiting and Training - the cost of funds annual cost to operate facilities and personnel to recruit or examine prospective sailors and entrants who will be assigned to ships or aircraft type.

2. Definitions (by number of personnel) - The costs related to manpower costs are provided below:

• Deployed Unit Operations

1. Aircrew (Officers) - This element represents officer personnel who operate the assigned aircraft. Although all personnel in the unit in the squadron, such as administrative, vision or squadrons staff, etc., etc., their primary duty is to be the aircrew and their full cost is shown in this element.
2. Aircrew (Enlisted) - This element represents enlisted personnel who serve as crewmembers for the aircraft.
3. Combat Command Staff - This element represents the pay of manpower necessary for management and supervision of squadron operations. Included in this element are:
 - the Air Wing Commander and his staff, allocated equally to each of the wing aircraft deployed on the carrier,
 - the squadron Administration Department,
 - the squadron Operations Department,
 - the squadron Executive and Executive Assistance Department,
 - the squadron Safety Department,
 - the squadron Photo Department if any, and
 - any other personnel whose primary function places them in this element.
5. Other Deployed Manpower - This is the cost of all squadron personnel who serve in support of administrative nature. It includes usually the remainder of the squadron personnel who are not costed in Elements 1. Aircrew (Officers), 2. Aircrew (Enlisted), 3. Combat Command Staff, or 7. Aircraft Maintenance Manpower.
6. Air Temporary Additional Manpower - This is the cost of travel, training and instructional expenses incurred so that personnel in the unit can receive training, usually at another installation.

- Below Depot Maintenance:
 7. Aircraft Maintenance - This cost item consists of the cost of all manpower required to support the total personnel and maintenance actions performed by the unit and its installed systems. This cost item also includes the squadron personnel who are assigned TAD to the Aircraft Maintenance and Handling Department.
- Installation Support:
 10. Base Operation Support - This cost item is base manpower and the other personnel necessary to provide the base services which support the squadron.
- Depot Supply:
 14. Depot Supply Operations - This is the cost of manpower and material for handling, storing, package, manage and control supplies, stores and repair parts used in obtaining and maintaining aircraft, aircraft components and support equipment. When a new aircraft is introduced into the force, spare parts are procured to sustain operations. These parts are introduced into the supply system and resources are expended to handle, store, distribute, package and crate both the spare items and other common supply items which support aircraft system personnel.
 15. Technical Support - This is the cost of a number of programs (usually maintenance oriented) which support aircraft operations. A partial list of these programs is given below:
 - Contractor Engineering Technical Services (CETS)
 - Navy Engineering Technical Service Guide
 - Depot Rework of Drawn, Assembled Equipment (DSE)
 - Installation and Disassembly Services
 - Depot Rework of Drawn, Assembled Gear
 - Technical Publications Support
 - NAVFIRESYNRM Repairable Items

- Personnel Support and Training.

17. Individual Training - This is the cost of preparing personnel in training who will replace existing personnel, the training starts and terminates at the recruit training through initial flight training and navigator training, as well as the operation and maintenance of training aircraft, including the Fleet Aviation Specialist Individual Training Detachments (FASID) and the Initial Air Maintenance Training Detachments (IATD). This element does not include any aspect of personnel training, which is costed in a separate category.
18. Health Care - health care is the cost of medical personnel and materials needed to provide medical support to aircraft unit personnel and to base personnel who provide direct support to the aircraft.
19. Personnel Support - personnel support is comprised of two parts. The first part is based on the costs incident to the permanent change of station (PCS) of squadron and flight refresher personnel, either individually or as an entire unit. The second portion is the cost of certification and examining activities, the cost of flight test personnel, and the cost of physicians.

C. DEFINITIONS OF AIR FORCE MANPOWER COSTS

The definitions of the manpower cost categories are provided below. These are similar to those in the cost development guide for aircraft operating and support. Note that when aircraft/aircrew is stated the term also applies to missile unit operators.

- Unit Mission Personnel - consists of aircrew operators, maintenance, and other unit personnel. The Air Force uses an average cost for officer and for enlisted pay and allowances. The cost does not include most Military Personnel Costs other than pay costs.
- Aircrew/operators - The cost of pay and allowances, for the full complement of flight operators required to operate the aircraft in the unit, part of a discrete unit.

- Maintenance - The pay and allowances for personnel performing organizational maintenance, intermediate maintenance, or other activities involving ordnance or munitions. Does not include aircraft maintenance.
- Other Unit Personnel.
 - Unit Staff - The pay and allowances for personnel required for unit operational command, flying supervision, personnel and control, planning, scheduling, flight safety, aircrew quality control, and unit administration.
 - Security - The pay and allowances for system security personnel, information security forces and related administrative personnel. Duties performed include entry control, close and distant boundary support, and security alert teams.
 - Remaining Unit Personnel - The pay and allowances for other personnel assigned to deployed units. It includes all other than unit (squadron) logistic, ground safety, and special mission personnel (e.g., photo developing and interpretation personnel, no reconnaissance units).
- Installation Support Personnel - The following three elements consist of those personnel not directly assigned to the unit, but are required for the unit to perform its mission in peacetime. Normally these people are assigned to the host organization at the installation and would not be required if the unit were moved elsewhere. The Air Force uses the same average cost factors as used for unit personnel personnel costs. The number of support personnel is calculated as a percentage of unit mission factors. The factors range from 15% to 18% of mission factors power depending on the command. The factor used for the Tactical Air Command is approximately 17%.
- Base Operating Support - The cost of personnel supporting the operation of the installation and the tenant organizations located there. These personnel are primarily responsible in the functioning of communications, utility services, security police (including physical security), and transportation. This also includes a portion of flight line support.

charged to mission elements, such as maintenance, finance, or personnel. Higher management, commander and operations staff are excluded.

- Real Property Maintenance - The cost of personnel assigned to the maintenance and operation of real property facilities and buildings, management and engineering support work and services.
- Medical - The cost of medical personnel assigned to support the unit at its peacetime location.

- Indirect Personnel Support

- Miscellaneous Operations and Maintenance - Miscellaneous unit and personnel costs not accounted for by other cost elements. These costs are funded under the O&M appropriation. Included are the costs for TDY travel, utilities, purchased services, miscellaneous supplies and equipment. Also included is the cost of miscellaneous medical supply support for all personnel.
- Permanent Change of Station - The cost of permanent change of station moves.

- Personnel Acquisition and Training - The Air Force uses cost factors for acquisition and training:

- Acquisition cost factors include cost of recruitment and basic military training.
- Training costs are developed by the Air Training Command (ATC). ATC, in coordination with the production contractor, attempts to reduce the manpower loading factor based on life cycle in the determination of high skill training requirements. For GLCM, ATC will develop special training standards based on such factors as the user requirements, equipment to be used, length of courses, and the number of students to be trained.

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